

Alcohol

All Risk, No Benefits

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Introduction

Peter Landless, Duane McBride, Myrnaliza Tan

Any organic product that contains sugars produces alcohol as a part of the decay process. We suspect that many readers have had the experience of keeping liquids (milk, apple juice, grape juice, etc.) in the refrigerator too long, only to find the bitter taste of alcohol when we tried to consume those drinks.

Beer, which contains between 1 and 5 percent alcohol,¹ likely emerged from the storage of grains that got wet and produced a type of mash that was somewhere between a beverage and a food. In ancient Egypt, beer was used to keep workers hydrated and was a part of their food allotment. The Code of Hammurabi guaranteed about half a gallon of beer a day, with administrators and clergy receiving a little more than a gallon.² If alcohol content had stayed at this level, the consumption of alcoholic beverages might not have resulted in the major health and social consequences that affect the world today! However, juices containing high sugar levels produce higher levels of alcohol.

Early in the human experience, we learned how to add yeast to the decaying organic matter and were able to increase alcohol content to about 12 to 17 percent. This was a considerable increase over the natural decaying process that produced alcohol from grains.³ The Greco-Roman world played a major role in the expansion of wine in daily life. Wine may have had an alcohol level of up to 20 percent, but it was often watered down. It has been suggested that, in the past, drinking beer or diluted wine may have been safer than drinking local water because the alcohol killed bacteria that likely lived in the water.⁴

The Greco-Roman world seemed to view access to alcoholic beverages as a basic human right, even for slaves. However, while the Greeks and Romans reveled in wine drinking, they were also aware of its negative effects.⁵ The Christian world inherited this positive attitude toward wine, and the moderate use of alcoholic beverages—beer or wine—was generally approved by the Catholic Church in the Middle Ages. The first generation of Protestant reformers, such as Martin Luther, appear to not have had any problems with the use of beer or wine. Luther often extolled the virtues of such local beverages.⁶

Perhaps the most dangerous alcohol-production technology developed when human beings began to distill the decaying organic mash by boiling. Alcohol is the first ingredient to evaporate. Then using a simple tube, you can collect this evaporation and produce a liquid with a high alcohol content—up to 95 percent. While there is evidence that distillation was understood in earlier times, the first well-documented distillation of wine was done by the Arabs. It then quickly entered European culture, with the Scots eventually calling whiskey the water of life.⁷

Typically, the alcohol level of distilled spirits is about 40 percent.⁸ As will be discussed in later chapters, research has

clearly shown that drinking distilled spirits results in faster and higher levels of intoxication. This often leads to domestic violence, impaired reflexes, cloudy judgment, and damage to health.

Religion and alcohol

The relationship between religion and alcohol use is complex. Mind-altering substances have been a part of many ancient religious traditions. Even the Abrahamic religions (Judaism, Christianity, and Islam) have had a complicated relationship with alcohol. Judaism has a strong belief against being drunk, but wine-drinking has been incorporated into the Sabbath ritual. Christianity, since its origins, has also opposed drunkenness, but has, in general, been tolerant of alcohol use; some denominations use wine containing alcohol in the Eucharist/Last Supper. Production, consumption, and distribution of alcoholic beverages almost exclusively occur in countries with Christian traditions. Islam has consistently opposed alcohol use. The Qur'an and the sayings of Mohammed make clear that any type of alcohol consumption is forbidden. It is even forbidden to drink fresh grape juice because of how fast it ferments and thereby contains alcohol.⁹

During what has been called the Christian Holiness Movement,¹⁰ some Protestant denominations opposed alcohol use. Churches were leaders in the passage of a constitutional amendment in the United States that forbade the production, distribution, or use of alcohol beverages in the early part of the twentieth century. In the US, alcohol prohibition lasted only from 1920 to 1933. During approximately this same period, other Western countries, including Canada, Norway, and Finland, also experimented with prohibition.

While prohibition undeniably funded organized crime, public health researchers have found that it also significantly reduced alcohol consumption and associated health and behavioral consequences.¹¹ Today, alcohol consumption is the highest in Eastern Europe, which has an Orthodox Christian tradition. Almost all of the Christian religious groups that opposed alcohol use in the past have dropped their opposition. There are only two big exceptions to this: the Mormons and Seventh-day Adventists.¹²

Function and meaning of alcohol in society

Social scientists have long observed that alcohol consumption appears to have several functions/purposes in societies that consume it. These include:

- **Coping**—The consumption of alcohol is used as a coping mechanism to deal with the stresses of life, reduce anxiety, and recover from a busy day.
- **Self-Medication**—Alcohol is often used to deal with physical pain as a type of analgesic or self-medication for mental-health conditions or physical pain.
- **Social Lubricant**—One effect of alcohol is disinhibition; that is, it reduces anxieties and emboldens people in social interactions. Alcohol is thus used for peer bonding, romantic interactions, sexual encounters, and other social situations.
- **Celebration from Personal to Public Culture**—Many individuals and societies across time and space celebrate major events in personal lives with a toast, and alcohol is baked into many major cultural events.

In many ways for most human cultures, alcohol is integrated with many aspects of culture and personal lives. For many people, it is difficult to think of a good time, a romantic encounter, or any type of celebration that does not include alcohol. One illustration of this is that during the first years of the COVID-19 pandemic, 2020–2021, alcohol distribution was considered an essential business, and stores remained open across much of the globe. Regulation changes were made that allowed for increased availability of alcohol, with associated consequences.¹³

Policy

As has been discussed, the earliest government records contain alcohol polices. Societies have frequently tried to regulate alcohol to control the obvious negative consequences of its use. The range of these policies have included:

- **Laissez-Faire Approach**—There are times when societies do not regulate the production, distribution, or consumption of alcohol. This characterized the policy of the United States in much of the nineteenth century. Alcohol and other very powerful drugs (including opium and cocaine) were available for common use among most age groups.
- **Prohibition**—This policy forbids the production, distribution, and/or consumption of alcohol, and policy violations resulted in criminal penalties. This was often a response to a laissez-faire approach in the United States and some European countries in the early part of the twentieth century. Today, countries with a majority Muslim population are the most likely to have alcohol

prohibition policies. However, enforcement can be sporadic.

- **Decriminalization**—This policy focuses on having few, if any, minor legal consequences to violation of any laws regarding alcohol.
- **Regulation/Legalization**—Much of the world’s policies would fall within this framework. Regulation/legalization focuses on policies that control and license the production and distribution of alcohol. These policies also contain regulations regarding the age of when individuals use alcohol, the places where alcohol can or cannot be used, and the legal definitions of impairment from alcohol.
- **Public Health/Harm Reduction**—Within this framework, these types of policies focus on attempts to reduce the harm caused by alcohol use through education and regulation.¹⁴

Definitions of alcohol use

The terms *binge drinking*, *heavy alcohol use*, and *alcoholism* (more recently called Alcohol Use Disorder, AUD) are often employed to describe drinking patterns. The National Institute on Alcoholism and Alcohol Abuse provides definitions of these terms, which inform the discussion of alcohol in this book.

Binge drinking generally means drinking five or more alcoholic drinks for males and four for females at the same occasion at least one day a month. Heavy use is generally defined as males consuming four drinks on any day or more than fourteen drinks per week. For women, it is three drinks on any day or more than seven per week.¹⁵

AUD is a medical diagnosis and is defined as “a chronic relapsing brain disorder characterized by an impaired ability to

stop or control alcohol use despite adverse social, occupational, or health consequences.”¹⁶

Alcohol and health

A few years ago, some research findings indicated that one or two drinks of an alcoholic beverage was related to reduced risk of heart disease. This was often called the French paradox because of the apparent low cardiac risks for the French population who drank moderate amounts of wine and also consumed a high-animal-fat diet.¹⁷ These findings were often used by individuals to justify their personal alcohol use and by the alcohol industry to tout the health benefits of moderate alcohol use. Their efforts resulted in governments defining moderate use of alcohol as part of a healthful diet.

However, there were major methodological problems with the findings that alcohol was beneficial to health. The definition of who was a nondrinker was not clear because those who stopped using alcohol because of the health consequences were included with nondrinkers. Other positive health and health-risk behaviors were also often not included.¹⁸ The most recent research has shown that there is no safe level of alcohol use and that alcohol has no heart-health benefits. Measurable health consequences exist for any level of alcohol use among all age groups. These include increased cancer rates, heart disease, and stroke.¹⁹

It is important to remember that this book is based on the most recent scientific findings regarding alcohol use, which have shown the significant health, community, family, and personal consequences connected with any level of consumption.

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Around the world, alcohol is responsible for half a million deaths from cancer each year or about 6 percent of cancer deaths globally.

CHAPTER 1

Alcohol and the Body

Peter Landless, David Williams, Gary Hopkins

How alcohol is processed

The study of the pharmacology of alcohol, or its effects on biological systems, has resulted in some very interesting findings. Once alcohol is consumed in sufficient quantities, it is rapidly distributed through the bloodstream to the brain and all organs of the body. Alcohol is soluble and dissolves in both water and fat, but it is most readily absorbed into fat tissues. It also moves quickly into muscle cells. For this reason, people who have a lot of body fat or are very muscular may show lower blood-alcohol levels after drinking compared to people with less fat and muscle tissue who consume the same amount of alcohol. Gender differences also affect absorption.

When alcohol is consumed and enters into the digestive system it absorbs directly into the bloodstream.¹ When a person drinks alcohol on an empty stomach, about 10 to 25 percent of the alcohol is immediately absorbed through the stomach lining (referred to as gastric absorption) into the blood. Within a minute, alcohol can be detected in the blood.

The liver is the primary organ in which the process of biotransformation (chemical changes during digestion) of alcohol occurs. The alcohol molecule is transformed into other intermediate chemicals, and ultimately, it is excreted from the body via the liver into the stool, the lungs when exhaling (thus alcohol can be smelled on the breath), and the kidneys in the form of urine.²

The process of alcohol biotransformation begins in the stomach with an enzyme called gastric alcohol dehydrogenase. Enzymes are biological catalysts, or assistants, that consist of proteins that work to drive the chemical reaction.³ The term “gastric” refers specifically to the stomach.

When alcohol enters the stomach, the molecules that do not absorb directly into the bloodstream are transformed chemically by alcohol dehydrogenase (the enzyme that breaks down alcohol) into other chemicals. Most of the biotransformation of alcohol occurs in the liver by this same enzyme. It is interesting that the highest levels of alcohol dehydrogenase are found in social drinkers rather than heavy drinkers, probably because social drinkers do not have the damage to the lining of the stomach caused by excessive alcohol use. People who take aspirin, which is known to irritate the lining of the stomach, have lower levels of alcohol dehydrogenase in the stomach.⁴

When alcohol is consumed on an empty stomach, the drinker will experience the highest blood-alcohol levels between thirty and one hundred and twenty minutes after a single drink. When alcohol is consumed with food in the stomach, the highest blood-alcohol levels are not reached until one to six hours later. All the alcohol consumed will eventually be absorbed into the bloodstream. After alcohol is ingested and alcohol

dehydrogenase breaks down the alcohol molecule, the alcohol is transformed into a second chemical called acetaldehyde.

How the process affects the body

Gender differences

Men and women absorb alcohol at different rates. This is partly because men produce more gastric alcohol dehydrogenase than do women. However, overall, women have less muscle density and more body fat than men. This means that alcohol tends to dissolve in women's bodies quickly and women become intoxicated more easily than men do. If a man and a woman drink the same amount of alcohol, the woman often becomes more intoxicated than the man. This can certainly lead to unwanted sexual behavior, particularly for women. The results of this can include unintended pregnancies or sexually transmitted infections such as HIV/AIDS. Clearly, alcohol and romance do not mix well.

Alcohol flush

People who drink even a small amount of alcohol can experience what is called "alcohol flush." This is predominantly due to an inherited deficiency in the enzyme aldehyde dehydrogenase. This is a chemical made in the liver responsible for converting alcohol so that it can be eliminated from the body once consumed. Approximately thirty-six percent of East Asians (Japanese, Chinese, and Koreans) show this physiological response to drinking alcohol that includes facial flushing, nausea, and rapid heartbeat. Alcohol flush has been shown to be a risk factor for developing cancer of the esophagus.⁵

Hangover

The “hangover” is a common symptom of alcohol use among average drinkers, but medical scientists disagree as to its cause. Some say a temporary buildup of acetaldehyde or some other compound found in alcohol-containing drinks produces a hangover. Others believe it may be the result of early alcohol withdrawal. What is known for sure is that 75 percent of those who drink to excess will experience a hangover at some point in their drinking lives. Symptoms of hangover include fatigue, malaise (sense of general unwellness), depression, dizziness, headache, sensitivity to light, tremors, thirst, and anxiety.⁶

Sleep cycle

Although alcohol use may induce sleep, in reality it interferes with normal sleep, or the sleep cycle. Sleep is defined as a state of rest. During sleep we do not have an awareness of the world around us. Without sufficient sleep, we cannot think clearly, work, or even play. It is detrimental to our health not to have enough sleep. However, how much sleep is “enough”? Most adults require seven to eight hours of uninterrupted sleep each night.⁷

People who consume moderate amounts of alcohol in the hours before going to sleep experience twice as many episodes of a condition called “sleep apnea.”⁸ When sleep apnea occurs, breathing stops for seconds or minutes at a time. This interruption of breathing results in a restless sleep that includes headaches, loud snoring, frequent awakening, and memory deficiency. Either because of malfunctioning muscles or a misfiring brain, the throat does not open in time with expanding lungs, so the blood fails to acquire sufficient oxygen.⁹

Alcohol and disease*The synergistic effect*

Alcohol tends to have a synergistic (interactive, combined) effect on other drugs, such as those used to treat anxiety and antihistamines (drugs commonly used for treating nasal congestion or a common cold). It also has a synergistic effect on many other drugs, such as intensifying the effects of nitroglycerin (used in patients with certain heart problems). People who take medications for elevated blood pressure should not consume alcohol, as it may increase the effectiveness of the medication, which would cause a lowering of the blood pressure to undesirable levels. Likewise, people who take medications for diabetes should not use alcohol. When used with alcohol, diabetes medications tend to prevent the body from completing the biotransformation process, which may result in alcohol poisoning, even with moderate doses of alcohol.

Additionally, alcohol is well known to be a substance that can irritate the lining of the stomach. A commonly used drug that also has this effect is aspirin. Therefore, alcohol and aspirin should not be consumed concurrently. People who drink heavily should avoid using the drug acetaminophen, also commonly known as Tylenol, which is a common over-the-counter medication used for decreasing pain or lowering high body temperatures. Those with liver damage caused by alcohol use have a condition that converts acetaminophen into a dangerous poison, even when the drug is used at recommended dosage levels. Finally, alcohol use should also be avoided by those taking certain antibiotics and medications for malaria.¹⁰

Cancer

The National Cancer Institute in the United States indicates that there is “strong scientific consensus that alcohol drinking can cause several types of cancer.”¹¹ Many people in our society today are unaware that alcohol has been found to be a group-one carcinogen, just like tobacco. When the International Agency for Research on Cancer Compounds classifies a compound or a physical factor as a group-one carcinogen, it means that there is sufficient scientific evidence to conclude that it causes cancer in humans. In fact, around the world, alcohol is responsible for half a million deaths from cancer each year or about 6 percent of cancer deaths globally.¹²

Moderate to heavy alcohol drinking is linked to oral, throat, liver, and colorectal cancer.¹³ However, any alcohol use increases the chances of getting seven types of cancer—liver, colon, oropharynx, larynx, esophagus, rectum, and female breast.¹⁴ It’s also important to note that research has found that this pattern exists for all types of alcoholic beverages. That is, even one glass of red wine a day increases one’s risk of cancer; and the more alcohol you drink, the higher your risk.

In conversations with many highly educated, professional female friends and colleagues, we have been very surprised to discover that few are aware that even moderate alcohol use increases a woman’s risk of breast cancer. Similarly, a 2019 study published in the journal *Preventive Medicine Reports* found that only one in every four American women aged fifteen to forty-four was aware that alcohol use could cause breast cancer.¹⁵

Dr. Walter Willett, one of the world’s leading nutrition researchers who chaired the Department of Nutrition at Harvard University for twenty-five years, summarized his research on alcohol and breast cancer by stating, “We now see

a 17 percent increased risk with only one drink every other day. What is remarkable is how modest that amount is.”¹⁶

Heart health

Alcohol use has complex effects on cardiovascular (CV) health. Some years ago, research suggested that a glass or two of an alcoholic beverage had cardiac benefits.¹⁷ However, the most recent research has found that there is no safe level of alcohol use, and even less than one drink a day is related to higher mortality rates. This occurs because of the effect of alcohol on cancer, but also because of the effect of alcohol on cardiovascular health.¹⁸

The associations between drinking and CV diseases such as hypertension (high blood pressure), diseases of the arteries feeding the heart muscle with blood, stroke, disease of other arteries in the body, and cardiomyopathy (a disease of the heart muscle) have been studied extensively. Through much research it is clear that there is a link between alcohol use and CV disease.¹⁹ Regarding cardiomyopathy caused by heavy use of alcohol, this is a condition where your heart actually changes shape because of long-term heavy alcohol use. The changes to your heart’s shape cause severe damage, leading to the failure of the heart to function as a pump and other severe problems. Abstaining from alcohol may help some people recover, but others will require medication or even surgery.²⁰

Cognitive function

Research has also documented that a moderate level of alcohol use has a negative effect on the functioning of the brain.²¹ Specifically, it leads to deterioration in the ability of an individual to accurately monitor what is occurring,

to detect challenges, and to adapt to environmental cues. To control one's behavior appropriately, it is necessary for the brain to accurately monitor and process what is occurring in the environment and adapt to environmental changes. One study, reported on in 2022, found that just one or two drinks of alcohol a day shrinks the volume of both gray and white matter in the brain.²² And the damage to the brain gets worse as drinking increases.

Summary

The bottom line is that alcohol use, including low to moderate consumption of alcohol, places a significant burden on the health of individuals, families, and societies. The UK Independent Scientific Committee ranked alcohol as the world's most dangerous drug based on nine criteria of harm to self and others.²³ That is, alcohol was ranked as worse than tobacco, cocaine, or heroin. The World Health Organization has said that "the harmful use of alcohol [is] not given proper attention in public policy. . . . Lesser health risks have higher priority."²⁴

World's Most Dangerous Drugs²⁵

1. Alcohol
2. Fentanyl
3. Heroin
4. Cocaine
5. Methamphetamine
6. Xanax (Alprazolam)
7. Oxycodone
8. Ketamine
9. Morphine
10. Diazepam

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