

BEYOND THE BASICS

Alcohol

What is alcohol?

Ethyl alcohol (ethanol), or beverage alcohol, is the type of alcohol found in alcoholic drinks. It is produced through the natural fermentation of fruit, vegetables or grains, or it can be human-made through the process of distillation. Beer and wine, which can have an alcohol content of up to about 15%, are examples of fermented alcoholic beverages. Distilled alcohol, such as rum, gin, whisky and vodka, can have a much higher alcohol content – often about 40%, but possibly up to almost 93%.¹ Pure ethyl alcohol is a clear, colourless liquid,² but individual alcoholic beverages have unique flavours and colours attained by the addition of other ingredients.

Beverage alcohol is a classic central nervous system (CNS) depressant, with effects ranging from mild relaxation to coma and death. It slows down brain functioning, affecting thinking and behaviour (for example, motor skills become impaired and inhibitions are reduced).² Alcohol is included in the sedative/hypnotic class of drugs; these drugs “diminish environmental awareness, reduce response to sensory stimulation, depress cognitive function, decrease spontaneity and reduce physical activity.”³

Slang names for alcoholic beverages include “booze” and “sauce.” Distilled beverages are often called “hard liquor,” “hard stuff” or “spirits.”

Medical Use

Research indicates that moderate consumption* of alcohol raises the levels of “good” cholesterol (HDL) and lowers the levels of “bad” cholesterol (LDL), thus reducing the risk of cardiovascular disease. However, it is not recommended alcohol be used to treat or prevent heart disease, as there are less risky alternatives, such as better nutrition and exercise.²

*Note that moderate consumption has been defined for Canadians in the Centre of Addiction and Mental Health’s *Low-Risk Drinking Guidelines*⁴ as no more than two standard drinks (see sidebar on page 3) on any one day. Consumption of up to nine standard drinks per week for women and up to 14 for men is considered moderate consumption. As well, there are situations where low risk drinking guidelines do not apply, such as when the person is pregnant, operating vehicles or has a family history of drinking problems.⁴

Alcohol is used in small amounts as an ingredient in some medications (i.e. cough syrup and laxatives).⁵

Prevalence of Use

The 2009 Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) found 76.5% of Canadians aged 15 or older had consumed alcohol during the 12 months prior to the survey. Of these, four categories of drinkers were identified. The percentage of drinkers in each category was⁶:

- *light, infrequent* (less than once a week and having fewer than five drinks in a sitting) – 36.1%.
- *light, frequent* (once a week or more and having fewer than five drinks in a sitting) – 31.3%.
- *heavy, infrequent* (less than once a week and having five drinks or more in a sitting) – 3.7%.
- *heavy, frequent* (more than once a week and having five drinks or more in a sitting) – 5.1%.

In the 2009 CADUMS, 8.3% of current users reported experiencing harm related to their alcohol consumption during the past year.⁶

Alcohol consumption by young people is a concern, as they are the most likely group to use alcohol in risky ways and experience harm as a result. These youth are at risk for developing long-term problems, such as dependence on alcohol, that may affect their lives into adulthood.⁷

Pharmacokinetics

Alcohol is soluble in both water and fat and is rapidly absorbed into the bloodstream from the intestine and less rapidly from the stomach and colon. If alcohol is consumed on an empty stomach, about 20% will be quickly absorbed from the stomach, with the remaining 80% absorbed in the upper intestine.³ The time for the peak blood concentration of alcohol (blood alcohol content, or BAC – see sidebar next page) to occur is usually about 30 to 90 minutes after the last drink.⁸

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After being absorbed into the bloodstream, alcohol readily enters the brain, where its main effects are exerted. It can also easily cross the placenta and enter the brain and other organs of a developing fetus.³

Five percent of ingested alcohol is excreted, unchanged, by the lungs in exhaled air.³ This constant proportion of ethanol in exhaled air is the basis for the breathalyzer test, which compares the amount of ethanol in exhaled air to the amount that would be present in blood.² The remaining 95% of the alcohol is metabolized by various enzymes, the most important of which is alcohol dehydrogenase (ADH). Most of this metabolism occurs in the liver, with some occurring in the stomach. If the drinker has eaten, the alcohol will stay longer in the stomach to be broken down by ADH located in the stomach lining. In this case, less alcohol will be absorbed into the blood stream, reducing the blood level (BAC) of the drug.³

After considering body weight differences, women will have a higher BAC than men, even when they drink the same amount, because:

- women have 50% lower levels of gastric ADH than men, so more alcohol will reach the blood stream through the stomach.³
- women have more body fat, which contains less water than muscle. With more body water, men disperse alcohol more widely throughout their bodies, resulting in a lower alcohol concentration.⁹

After initial metabolism by ADH and other enzymes, alcohol is further broken down and excreted from the body, mostly in the urine.³

Pharmacodynamics

It was once believed the only mechanism by which alcohol exerted its effects was through a non-specific depressant action on nerve membranes and synapses. This is evidently the mechanism of the high-dose anesthetic effects of alcohol: at very high concentrations, alcohol interacts with membranes, causing a disturbance in the functions of these critical structures. This results in a non-specific and indirect depression of the CNS.⁸

Studies have since revealed that, at lower concentrations, alcohol seems to affect the synaptic activity of various neurotransmitters, especially the major excitatory (glutamate) and inhibitory (GABA) systems.³ The result of these receptor interactions is an enhanced inhibitory “tone” of the CNS, with accompanying sedation, muscle relaxation and impairment of cognitive and motor skills.⁸

Short-term Effects

BAC (see sidebar at top) rises when a person drinks faster than the alcohol is metabolized, allowing it to accumulate in the body and cause intoxication.¹⁰

The first noticeable changes in mood and behaviour occur at about 0.04% to 0.05% BAC when the drinker feels euphoric and becomes more relaxed,

Blood Alcohol Content (BAC)

The amount of alcohol in the body is expressed as the BAC. This refers to the weight of alcohol (expressed in milligrams) in a standard volume of blood (usually 100 millilitres). So, a BAC of 0.08% means the person has 80 milligrams of alcohol per 100 millilitres of blood. BAC can be expressed as 0.08 or 0.08% or 80 mg%.¹¹

sociable and talkative. Changes continue as BAC rises, escalating from slurred speech and impairment of balance, vision and reaction time at 0.07% to 0.09% BAC, through to gross motor impairment, staggering gait, blurred vision, anxiety and nausea at 0.13% to 0.20% BAC. As the BAC rises from here, the drinker can vomit, have a period of memory loss, enter a coma and possibly die from respiratory arrest.⁹

Other short term effects that occur as the level of alcohol in the blood rises include:

- loss of body heat as the blood vessels in the skin dilate.³
- increased urine production.³
- feelings of hostility in some people that may lead to violence.²
- feelings of depression in some people.²

The apparent “stimulating” or “social lubrication” effect of ethanol at low BAC actually results from suppression of the brain regions responsible for inhibitions.¹⁰

Long-term Effects

There are many negative effects of chronic, heavy alcohol use, two of which are:

- liver diseases, the most serious being cirrhosis of the liver, a condition in which normal liver cells are damaged and replaced by scar tissue, keeping the liver from performing its vital functions.¹²
- brain damage and memory loss, which may progress to Wernicke-Korsakoff syndrome. People with this syndrome may experience dementia-like loss of brain function.¹⁰

Other long-term effects include: heart failure; pancreatitis (which can lead to diabetes); damage to the stomach and intestines; damage to the peripheral nervous system causing numbness in the feet and walking difficulties; impotence and sterility in men; menstrual problems and infertility in women; depression; insomnia; and various types of cancers, including throat, esophagus, rectum and breast.²

Chronic heavy drinking can also cause depression of the immune system, leading to a predisposition to infections.¹³

Vitamin deficiencies can develop in heavy drinkers when they eschew a normal diet in favour of a high-alcohol diet, as alcohol has little nutritional value.³ For example, alcohol-related vitamin B1 (thiamine) deficiency is responsible for some of the cognitive impairment seen with longer term alcohol abuse, and also contributes to Wernicke's encephalopathy and Korsakoff's psychosis.¹⁰

Alcohol in Standard Drinks

While the alcohol content in the various forms of alcoholic beverages differs, the following “standard” servings all contain 13.6 grams of alcohol.¹⁴

- one 341 mL (12 oz.) bottle of beer (5% alcohol). (Some stronger beers have more than 5% alcohol, while light beers have less.)
- one 142 mL (5 oz.) glass of wine (12% alcohol).
- one 43 mL (1.5 oz.) glass of distilled alcohol (40% alcohol) (i.e. rum, whiskey, vodka).
- one 85 mL (3 oz.) glass of fortified wine (16 to 18% alcohol) (i.e. sherry, port, vermouth).

Toxic Effects

People who drink a lot of alcohol quickly may experience an overdose, leading to unconsciousness.¹⁵ Even if they stop drinking, their bodies will continue to absorb the dangerously high concentration of alcohol already in their gastrointestinal system. The centres of the brain that control breathing will be suppressed, possibly leading to death.¹⁵ A BAC of 0.5% is considered a lethal dose.²

Tolerance and Dependence

Drinkers develop tolerance to alcohol (a need for more alcohol to get the desired effect) depending on the amount they drink and the pattern of their drinking. Moderate or infrequent drinkers are less likely to develop tolerance, while heavy, frequent drinkers will develop tolerance. Tolerance develops because the chronic drinker’s liver increases the amount of enzyme needed to metabolize the alcohol. As well, some people develop “functional” tolerance in which the brain adapts to the amount of alcohol present. A person with this type of tolerance will appear less intoxicated than a non-tolerant individual with the same BAC.³

Drinkers can become physically dependent and suffer withdrawal symptoms (see next section) if they suddenly stop drinking.² They can also become psychologically dependent, meaning they continue drinking because they think they need it for a variety of reasons, such as to enhance their ability to socialize or to relax.¹⁰

Withdrawal

Mild withdrawal symptoms, commonly referred to as a “hangover,” occur when people drink heavily over a short period of time. Symptoms usually start eight to 12 hours after the drinking stops and include headaches, shakiness, nausea and vomiting. In about 24 hours, the symptoms clear up.¹⁶

People who are physically dependent on alcohol can experience more severe withdrawal symptoms that occur when drinking is discontinued. Starting a few hours after the last drink and lasting up to three or four days, these effects include tremulousness (“the shakes”), anxiety, nausea, vomiting, seizures and hallucinations.^{10, 17}

These withdrawal symptoms usually fall into three stages, with the last being the most serious. Called “delirium tremens,” the individual experiences severe sympathetic nervous system hyperactivity (for example, high blood pressure, rapid heart rate and fever) and psychosis and may have vivid visual, auditory or tactile hallucinations. Medical intervention should be sought if severe withdrawal symptoms occur.¹⁷

Risks & Other Harms

As well as the possible health related problems discussed earlier, people who choose to consume alcohol should be aware of other risks:

- When mixed with drugs that induce sleepiness (prescription or illegal), alcohol can be dangerous. These include other CNS depressants, such as benzodiazepines, which are widely prescribed to treat anxiety. This is because depressant drugs each increase the other’s effects.^{2, 3} Also, many other types of prescription drugs can interact negatively with alcohol, so advice from a medical professional should be sought before mixing alcohol with any medication.
- People can get sick if they ingest methyl alcohol, which is poisonous. Methyl alcohol is found in various products, such as cleaners, hair sprays and antifreeze.²
- As is the case in any abuse of licit and illicit drugs, there are potential adverse consequences related to the law, a person’s financial situation, family relationships, and generally putting oneself at risk by participating in unsafe behaviours while under the influence of alcohol.

Pregnancy & Lactation

Alcohol use during pregnancy can cause fetal alcohol spectrum disorder (FASD). There is a range of problems children with this disorder can experience, including learning problems, controlling their behaviour, understanding the consequences of their actions and interacting with people.¹⁸ The extent of the symptoms varies among those affected. As well, some have facial malformations, such as a thin upper lip, an indistinct groove between the nose and upper lip, and shortened eye openings.¹⁹

The only cause of FASD is consuming alcohol during pregnancy, and therefore it is preventable. There is no amount of alcohol that is known to be safe for consumption during pregnancy, and there is no known time during pregnancy in which alcohol consumption is known to be safe. For these reasons, it is best to abstain from alcohol for the duration of pregnancy and breast feeding.¹⁸

Alcohol passes into the breast milk and is ingested by the baby, but a baby’s body can only eliminate alcohol at half the rate of an adult. Risks to the baby include motor development impairment and sleep problems. Also, the rate of milk production can reduce if the mother drinks alcohol.²³

Illegal Production

According to Canadian law, it is illegal to own a still or other equipment that can be used to make spirits (such as rum, vodka, whiskey) unless one is licensed to do so. It is legal, however, for people to brew wine or beer as long as it is for their own personal and family use.²⁰

Legal Issues

The manufacture, distribution, advertising, possession and consumption of alcohol by Canadians is the joint responsibility of the federal and provincial governments. Some legal highlights include:

Sources

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- Each province and territory in Canada determines the age at which its residents can buy and consume alcohol. That age is 18 in Alberta, Manitoba and Quebec and 19 in all other provinces and territories.¹⁶
- It is illegal in Canada to drive with a BAC of 0.08% and over. Serious penalties result from doing so.²¹ In all provinces and territories, drivers whose BAC is under 0.08%, but over a specific minimum BAC, may also face consequences, such as losing their licence for a 24-hour period, being required to pay fines, and undergoing an assessment by an addictions professional to ascertain whether addiction is an issue.¹⁶
- The courts in many jurisdictions across Canada have found that alcohol providers have a "duty of care" to prevent incidents resulting from excessive alcohol use that may lead to injury. This duty of care requires the alcohol provider – whether it be a bartender, server or an individual hosting a party in their own home – to take reasonable steps to prevent harm occurring to an intoxicated person, particularly since the courts have recognized that an intoxicated person is not able to exercise that care for him or herself because of impaired judgment.²²

Substance Use & Mental Health

- Substance use and mental health problems can often occur together. This is commonly referred to as a co-occurring disorder.
- Substance use may increase the risk of mental health problems.
- People with mental health problems are at higher risk of developing substance abuse problems:
 - Sometimes they use alcohol and other drugs in an attempt to relieve themselves from mental health symptoms.
 - For most people alcohol and other substance use only covers up the symptoms and may make them worse.

Remember: A person's experience with any drug can vary. Here are a few of the many things that may affect the experience: the amount and strength of the drug taken, the setting, a person's mood and expectations before taking the drug, gender, overall health, past experience with that drug and whether more than one drug is being used at the same time. Using alcohol and other drugs at the same time can also be dangerous.

The Addictions Foundation of Manitoba (AFM) offers a broad range of prevention and treatment services for alcohol, other drugs and gambling. These are designed to meet the needs of all Manitobans and include harm reduction and abstinence-based programs.

For more information, contact your local AFM office or visit our website: www.afm.mb.ca.

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