

Alcohol and Health Series

# Alcohol and the Body



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## Introduction

Alcohol, whether you drink or not, is a commonly used drug you may interact with as a health professional in your community. The **Alcohol and Health Series** provides an opportunity to learn about alcohol from many different angles. This resources focuses on alcohol and the human body.

## What is Alcohol

Alcohol is a legally available drug in Alberta for those over 18 years old. Alcohol's chemical name is ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ) or **ethyl alcohol**. Pure ethyl alcohol is a clear, colourless liquid. As a drug, alcohol is a substance that changes the way a person thinks, feels, or behaves. Alcohol is a **depressant** and it affects every organ in the body.

In alcoholic beverages, pure ethyl alcohol is diluted with different ingredients that affect the colour and consistency. **Beverage alcohol** is produced by fermenting or distilling various grains, fruits, or vegetables. Beer, wine and cider are made through fermentation (lower alcohol concentration), and spirits including vodka, gin, rum and whiskey go through an industrial distillation process (higher alcohol concentration).

**Other forms of alcohol are not for drinking and come with serious dangers.** There are other chemicals present in these products.

- Methyl alcohol (methanol), another clear, colourless liquid, is very poisonous and must never be consumed. It cannot be made nonpoisonous. Even a very small volume of methanol can cause blindness or be fatal. Methyl alcohol is contained in paint removers, antifreeze, liquid fuel, lacquer thinner, and some industrial cleaning solutions.

- Some forms of ethyl alcohol (ethanol) are not meant to be consumed, and cause toxic effects and danger of overdose such as rubbing alcohol, vanilla extract, aftershave lotions, cooking wines and mouthwashes.

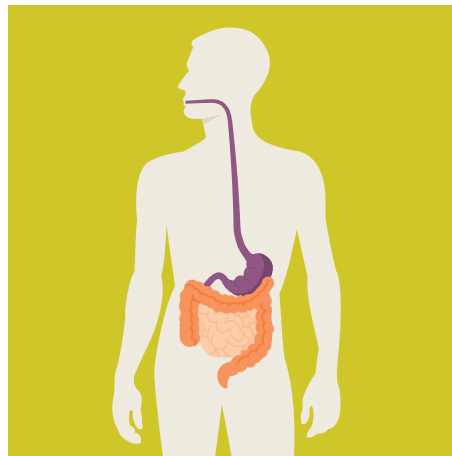
Now that we understand a bit about what beverage alcohol is, let's begin by learning about how beverage alcohol moves through the body once it leaves the mouth.

## Alcohol Absorption

As alcohol arrives in the stomach, 20% of the alcohol passes through the stomach wall into the blood. Most of a drink of alcohol is absorbed through the small intestine into the blood (75-80%). Because alcohol dissolves easily in water, it is also absorbed very rapidly by the bloodstream and moved to all the organs in the body.

The rate of alcohol absorption is affected by:

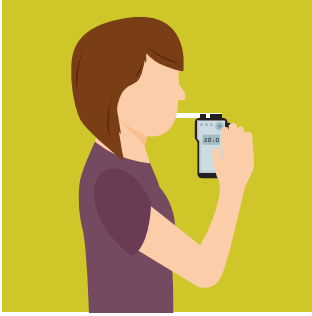
- The presence of food in the body,
- The concentration of alcohol consumed, and/or
- Genetic factors, body size and composition.



### The Presence of Food in the Body

Food in the stomach slows the absorption of alcohol in the stomach and delays passage of alcohol into the small intestine (where most absorption takes place). The higher the fat content of the food in the stomach, the more time is required for gastric emptying from the stomach into the small intestine, and the slower the process of alcohol absorption. Where there is no food present when alcohol is consumed, alcohol quickly moves into the small intestine.

## The Concentration of Alcohol Consumed



The effects of alcohol depend on how much is in the bloodstream—the blood alcohol concentration (BAC). Alcohol concentration in the body increases as the person drinks:

- More volume of alcohol,
- Higher percent alcohol beverages, and/or
- Faster, more drinks over a shorter period of time.

Alcohol circulates through your body until it is eliminated.

## Genetic Factors, Body Size and Composition

Variations in the enzymes that break down alcohol in different people have meant that there are some genetic factors at play in alcohol metabolism. Biological females have less alcohol dehydrogenase, the enzyme that breaks down alcohol in the stomach, so more alcohol gets into the bloodstream.

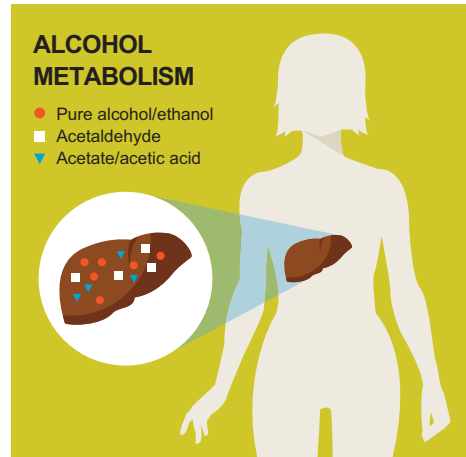
If two people drink the same standardized amount alcohol:

- The person who **weighs less** typically will have the **higher blood alcohol concentration**.
- And the people weigh the same amount, the person with the **higher percent of body fat** (verses muscle) will have the **higher blood alcohol concentration**.
- And weigh the same amount, the person who is **older** and typically has **lower water content** in their body will have the **higher blood alcohol concentration**.

Biological females consuming the same amount of alcohol as biological males of the same weight have higher blood alcohol concentration because they have less body water to dilute the alcohol concentration.

# Alcohol Elimination

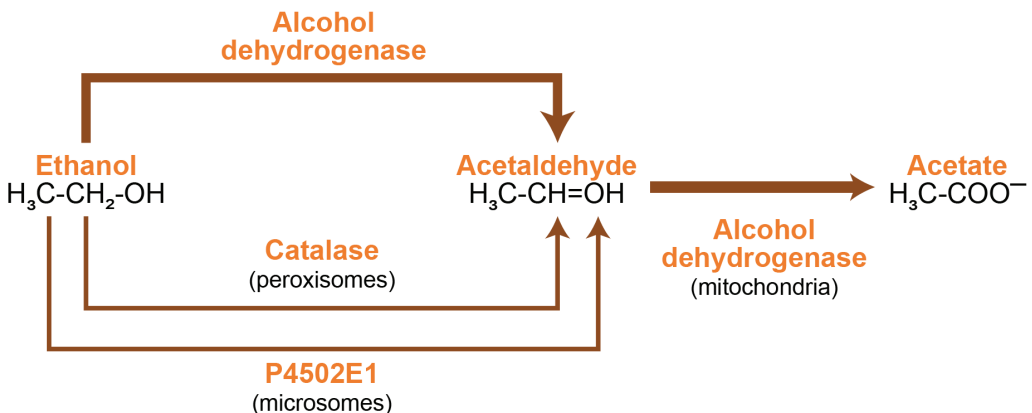
Alcohol is broken down or metabolized in the body primarily by the liver. Alcohol is eliminated from the body when it is metabolized and then excreted from the body. Some alcohol is also metabolized by the brain, pancreas, and stomach. It is eliminated through urination, perspiration and breathing.



## How the Liver Breaks Down Alcohol

**Regardless of how much alcohol a person drinks, the body can only metabolize a certain amount of alcohol every hour. That amount varies across people.**

Liver size, body mass, and different variations in the ADH and ALDH enzymes result in different efficiencies in breaking down the ethanol in the alcoholic beverage. In the first stage of metabolism in the liver, an enzyme called alcohol dehydrogenase breaks the alcohol into acetaldehyde, a highly toxic substance that affects the entire body. Acetaldehyde build up happens especially when higher amounts of alcohol are consumed.



Reference: US Dept of Health & Human Services, National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism. (April 2007). Alcohol Alert Number 72. <https://pubs.niaaa.nih.gov/publications/aa72/AA72.pdf>

# Immediate Effects of Drinking on the Body

## The Brain and Nervous System



Alcohol in the blood moves quickly to the brain, so the effects of alcohol on the brain begin rapidly after having a drink. Alcohol slows down and depresses the brain and central nervous system. It depresses the parts of our brain that inhibit our actions and restrain our behaviour. The ability to think is slowed, and speech can be affected too (e.g. slurred speech). Coordination and fine motor functions (e.g. staggering gate) and reaction time in any activity is slowed. The more alcohol is consumed, the larger these brain and central nervous system slowdowns.

## The Heart and Cardiovascular System



Just one or two standard drinks can affect heart rate, blood pressure, circulation and contractions of the heart muscle, including the heart's ability to pump blood through the body. While these reactions are generally not clinically significant, they may be serious if an individual has pre-existing cardiovascular problems.

Alcohol causes the small blood vessels beneath the skin to dilate, which increases blood circulation. Some heavy drinkers have a ruddy complexion because of dilated blood vessels. The dilation of blood vessels also causes heat loss, and a drop in body temperature. Contrary to popular belief, it is dangerous to drink alcohol to "warm up" when exposed to the cold.

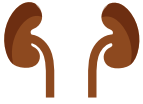
## The Intestines



As soon as alcohol is ingested, the intestines begin to secrete acid. As the blood alcohol concentration rises, secretions of pepsin, a digestive hormone, are reduced, leading to an irritation of the intestinal walls. This irritation can cause diarrhea.



## The Kidneys



As alcohol levels rise, the pituitary gland reduces secretions of the hormone that maintains the body's proper hydration level. When the kidneys are no longer able to reabsorb sufficient water from the urine, the body ends up eliminating more water than it absorbs, which causes dehydration. The symptoms of dehydration are fatigue, back and neck pain, and headaches.

## The Lungs



A small amount of alcohol is eliminated from the body in one's breath; this is why initial roadside testing of impairment may use a breath test to indicate the presence of alcohol. Breathing is affected as the level of blood alcohol concentration rises.

## The Placenta in a Pregnant Person

Prenatal exposure to alcohol happens when alcohol flows back and forth through the parent's body to the fetus via the placenta. The fetus will be exposed to the same blood alcohol concentration level as the parent but the fetus cannot break the alcohol down in their own body, and so the fetus risks life-long effects from alcohol at any stage of pregnancy.



## The Breast and Breastfeeding

Alcohol is passed through the breast in breastfeeding to the baby. Drinking alcohol has been associated with reduced milk production, blocked release of oxytocin and may interfere with the milk ejection reflex.

Alcohol in a parent's breastmilk may match the blood alcohol concentration in the parent's blood. The frequency of drinking, the volume and percent alcohol of the drinks consumed by the parent will affect the baby. The age of the baby and their body's ability to metabolize the alcohol will also impact the baby's blood alcohol concentration level and the alcohol's effect on the baby. As each of these factors vary for each parent and each baby, **the safest course is for the breastfeeding parent to avoid alcohol altogether.**

# Conclusion

With this resource you explored how alcohol affects the body in so many ways at the time it is consumed. Please consider reading more of the topics in AHS' Alcohol and Health Series (listed on the inside of the back cover).

To find out more about how we can help you, your family, your workplace, your school or community create health promoting or preventative change related to alcohol use email [addiction.prevention@ahs.ca](mailto:addiction.prevention@ahs.ca).

To find an addiction services office near you, please call the **24-hour Addiction Help Line, 1-866-332-2322**. For 24/7 nurse advice and general health information call Health Link at 811.

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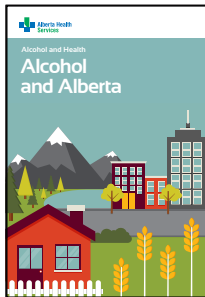
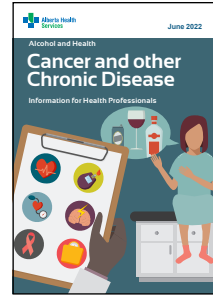
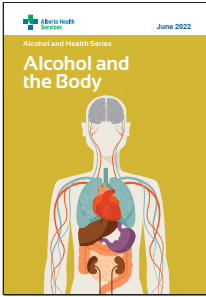
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# Explore the AHS Alcohol and Health Series



## More information means informed decisions

Well informed health professionals and communities will be more aware of the impacts of alcohol on their health and the health of those around them. This awareness provides the opportunity for upstream conversations on how to prevent or reduce alcohol-related harms.

The Alcohol and Health Series is available digitally and in print.

[Alcohol & Health Series | Alberta Health Services](#) (digital download)

Allied health professionals should contact their local AHS Addiction and Mental Health office to access print copies.

Alberta Health Services offers a wide range of  
addiction and mental health services.

For individuals looking for help for someone they care about,  
or for themselves the Addiction Helpline and the  
Mental Health Helpline are available.

**Addiction Helpline**  
**1-866-332-2322**

**Mental Health Helpline**  
**1-877-303-2642**

Both helplines are free, confidential and  
available 24 hours a day.

