ALCOHOL AND HEALTH

ALCOHOL AND THE HUMAN BODY

Éduc'alcool
Every five years, Éduc'alcool conducts a major survey in Québec. In the most recent one, we asked people which drinking-related subject was of greatest interest to them.

More than 70% of all respondents said they wanted to know the effects of alcohol on the human body.

In response to that overwhelming request, Éduc'alcool is pleased to add this new monograph to its Alcohol and Health series. Its purpose is to provide information and influence behaviour, using simple, easy-to-understand language.

Éduc'alcool believes strongly that one way to prevent alcohol abuse is to make sure that people know exactly what happens to their bodies – and to the alcohol – when they drink.

People who are equipped with accurate information are more likely to be aware of the dangers of abusive drinking, and understand even more clearly the importance of drinking moderately and responsibly.

When it comes to drinking, there is no hard and fast rule that holds true for everyone. Each of us must take our specific differences into account as we make our own choices. Nonetheless, the path that alcohol travels through body is the same for everyone. And it remains true that excessive, abusive drinking and intoxication will always be unacceptable – socially, culturally and medically.

In other words, moderation is always in good taste.

The Éduc'alcool Board of Directors
More than 80% of Quebecers drink alcohol regularly, most of them moderately. Anyone who drinks should be aware that alcohol is not like any other food. They should also know what happens physiologically when they drink: how the alcohol is absorbed, how it is eliminated, and the impact it has as it travels through the body.
Why does alcohol get into the bloodstream so quickly?
Alcohol is absorbed very quickly by the blood and spreads easily to all the organs. That's because alcohol molecules are very tiny. They don't have to be broken down by digestive enzymes to get into the blood, and they dissolve easily in water and fat, both of which are prime components of the human body.

Why is alcohol absorbed more quickly when the stomach is empty?
Alcohol moves quickly from the mouth to the stomach and on to the intestines. Some of it is absorbed directly through the mucosal lining of the mouth and esophagus, some is absorbed through the walls of the stomach and the rest is absorbed by the intestines, mainly the small intestine.

If there is no solid food in the stomach or intestines, the alcohol will come into contact with the intestinal walls more easily and pass quickly into the blood. All the alcohol of one drink may well be absorbed within 30 minutes.

However, if your stomach is relatively full, the alcohol will stay there longer. The absorption process will be slower and may take up to 90 minutes.

Why is stronger alcohol absorbed more slowly?
Beverages that are more than 20% alcohol irritate the lining of the stomach. This slows the opening of the pyloric valve, through which the contents of the stomach pass into the small intestine. Drinking several shots of spirits one after the other in the hope of getting drunk quickly may actually produce a delayed reaction.

Why does alcohol go to your head so quickly?
Once it's in the bloodstream, the alcohol spreads to all parts of the body and is distributed in all tissues containing water. Because alcohol is carried by the blood, it follows that it will be delivered particularly quickly to organs with many blood vessels, such as the brain, the lungs and the liver.
Why is there alcohol in the breath you exhale and in breast milk?
Some alcohol (about 10%) is eliminated as is, through urine or perspiration. It can also be eliminated through the breath, since the bloodstream carries it to the lungs. This is why a breathalyzer can effectively measure your blood alcohol level (breath alcohol testing device).

Nursing mothers should be aware that the concentration of alcohol in breast milk is about 10% higher than in the blood, because of the high water content of the milk.

How is alcohol metabolized by the liver?
Most of the alcohol (about 90%) is eliminated by the body's metabolism. While the kidneys and gastro-intestinal tract play a role in this process, the liver is the organ primarily responsible for transforming the alcohol absorbed by the blood.

In the first stage of metabolism in the liver, an enzyme called alcohol dehydrogenase transforms the alcohol into acetaldehyde, a highly toxic substance that affects the entire body. This activates another enzyme – acetaldehyde dehydrogenase – which transforms the toxic acetaldehyde into inert, harmless molecules of acetate, or acetic acid.

Why do different people eliminate alcohol differently?
No matter how much or how little you drink, your liver can only metabolize 15-17 mg of alcohol every hour. The speed at which it does so depends primarily on the number of metabolic enzymes in the liver, which varies from one individual to the next and is thought to be genetically determined. Other factors also influence the process.
Food: Full stomach or empty stomach?
The speed at which alcohol is eliminated depends on the amount and type of food present in the gastro-intestinal system. During digestion, the stomach's contents are passed into the small intestine (a process known as gastric emptying). The higher the fat content of the food in the stomach, the more time is required for gastric emptying, and the slower the process of alcohol absorption.

Scientific studies have shown that people who drink after a meal rich in fats, proteins and carbohydrates absorb alcohol more slowly than those who drink on an empty stomach.

Gender does matter: Me Tarzan, you Jane
All other things being relatively equal, if a woman and a man drink exactly the same amount, she will have a higher blood-alcohol level than he does. That's because women generally weigh less than men and their bodies have a higher fat content. Lower body weight means lower water content, so the alcohol is dissolved in a smaller amount of liquid. This results in a higher concentration of alcohol in the woman.

Because women are generally smaller than men, they also have less alcohol dehydrogenase in their bodies, which means that a greater percentage of the alcohol women drink remains in their blood.

Age matters, too: Teens and seniors, beware!
Teens and older people don't tolerate alcohol as well as others, mostly because of their (generally) lower body weight. Consequently, as with women, the alcohol is dissolved in a smaller amount of liquid.

Also, teenagers have fewer alcohol-eliminating enzymes in their livers than adults do.

Alcohol and medication: Unforeseeable reactions
Some medications can hinder the elimination of alcohol, heighten or mask its effects, or provoke unforeseeable reactions.

Conversely, alcohol can reduce the effectiveness of some medications or hinder their elimination.
It affects you differently

Why does alcohol have such an impact on the brain?

Before it reaches the liver, the alcohol in the blood affects other vital organs that contain a lot of water and require a significant volume of blood in order to function. The most immediately observable effects can be seen in the brain. Alcohol restricts a number of brain functions by stimulating the brain’s pleasure centres. At first, the effects are pleasurable: there is a reduction in stress and inhibitions, and a sensation of either calm or excitement.

How you feel depends on your mood at the time. If you are sad or angry before you drink, the alcohol may initially put you in a better mood. But then the opposite occurs, and you may well end up even sadder or angrier than you were before you started drinking.

Alcohol and stress
Alcohol often goes hand-in-hand with, and even promotes, sociability, conversation, pleasure and a sense of well-being. Among the social and psychological benefits of alcohol, some people report an increase in creativity; and alcohol also has a certain therapeutic value as a means to reduce stress.

But while a small amount of alcohol may relieve stress in the short term, it does absolutely nothing to treat the source of the stress. In fact, studies show that the opposite is true: over the long term, alcohol increases anxiety levels. When the anxiety persists, the desire to self-medicate with more alcohol can lead to an alcohol dependency.

Alcohol and sleep
People commonly believe that alcohol helps you sleep. Certainly, it can help you fall asleep. But alcohol interrupts normal sleep cycles, and the morning after a night of heavy drinking may find you feeling tired and unwell, even if you have slept a long time. What’s worse, alcohol can cause insomnia and frequent sleep interruptions, in addition to exacerbating existing sleep problems.

Alcohol and sex
Alcohol can cause or aggravate sexual problems. Abusive drinking, for example, can make it difficult for men to achieve an erection and for women to achieve orgasm.
Why does alcohol change behaviour?

Numbing effects
As your blood-alcohol level rises, your brain's motor and sensory centres are affected. You begin to have difficulty with coordination and fine motor functions, and your reaction time slows.

The effects can be minor or major, depending on how much you drink. If you have a blood-alcohol level of .08, or 80 mg of alcohol per 100 ml of blood – the legal limit for driving a motor vehicle in Canada – your reaction time will be 30% 50% slower than when you have no alcohol in your blood. For example, driving under the influence of alcohol will make it difficult to brake quickly if the car ahead stops suddenly.

Aggression
As you become intoxicated, your speech, thought processes and senses are affected. Your cognitive and verbal skills are diminished; and since these are the skills that allow you to resolve conflicts, there is a greater likelihood of aggressive and violent behaviour.

Vomiting
The part of the brain that controls vomiting is affected by the alcohol and toxic acetaldehyde circulating in your blood.

Dehydration
Alcohol also affects the pituitary gland, resulting in reduced secretions of the anti-diuretic hormone that maintains the body's proper hydration level. More specifically, the kidneys are no longer able to reabsorb sufficient water from your urine, and your body ends up eliminating more water than it absorbs. The symptoms of dehydration are fatigue, back and neck pain, and headaches.

Alcohol and young people
Recent discoveries in neuroscience and child psychiatry show that the brain is not really fully developed until after age 20. The brains of adolescents are therefore more vulnerable to alcohol-related damage than adult brains.

Other studies highlight the effects of alcohol on the ability to learn and make decisions.

The earlier children begin to drink with their peers, the greater the risk that they will develop an alcohol dependency later on.

Habituation
The immediate effects on the brain are often less apparent among people who drink regularly, because they have developed a strong tolerance for alcohol. As a result, they can often drink a great deal without feeling too many short-term effects. Such tolerance is both metabolic – the liver processes the alcohol more quickly and efficiently – and functional – the person learns to compensate for the deficits caused by alcohol.

Nevertheless, the harmful effects of drinking will be seen and felt in the long term. In fact, people whose bodies are habituated to the immediate effects of alcohol are generally those who drink abusively.
How does alcohol affect other vital organs?

Heart and cardiovascular system

Just one or two drinks can affect your heart rate, blood pressure, circulation and contractions of the heart muscle, including its ability to pump blood through your body. While these reactions are generally not considered significant from a clinical point of view, they can be more serious if you already suffer from cardiovascular problems.

Nonetheless, as of a certain age, regular, moderate drinking can provide some protection against cardiovascular disease and peripheral vascular disease.¹

Among other things, alcohol causes the small blood vessels beneath the skin to dilate, which increases blood circulation. You may have noticed that some heavy drinkers have a particularly ruddy complexion. What you’re seeing is the result of the dilated blood vessels.

The dilation of blood vessels also causes heat loss, and a drop in body temperature. Contrary to popular belief, it is very dangerous to drink alcohol to “warm up” when you are exposed to the cold.

Intestines

As soon as even a small amount of alcohol is ingested, the intestines begin to secrete acid. As the blood-alcohol level rises, secretions of pepsin, a digestive hormone, are reduced, leading to an irritation of the intestinal walls and eventually diarrhea.

Pancreas

The pancreas produces insulin, which the body needs to control blood sugar levels. Drinking causes a sudden spike in blood sugar; the pancreas responds by producing more insulin. This causes a rapid drop in blood sugar and the symptoms of hypoglycemia – dizziness, headaches, difficulty concentrating, depression, anxiety, trembling, cold sweats, heart palpitations, loss of coordination, and stomach aches.

¹ Éduc’alcool, Alcohol and Health: The health benefits of moderate and regular alcohol consumption, 2005.
Understanding the physiological effects of alcohol can, among other things, help you calculate your blood-alcohol level, taking into account the various factors that affect the rate at which your body absorbs alcohol. This information is vital for anyone who has to do something demanding like drive a motor vehicle or participate in physical activity.

It is certainly good to know how much alcohol you have absorbed before you drive. But there are better reasons for understanding how alcohol affects the various organs and systems in your body. More information helps you make better choices. When you have more knowledge, you tend to make more enlightened decisions.

Ultimately, we hope that people who know more about the subject will understand the very real impact alcohol has on the human body.

Well-informed people will be more conscious of the unpleasant and dangerous side-effects of abusive drinking, and, we hope, more aware than ever that moderation is always in good taste.