

Alcohol

Introduction

In our society, alcohol is so much a part of social events that it is usually not thought of as a drug, particularly since it is self-prescribed. Yet it is still by far our most used and abused drug.

Alcohol is a depressant drug and is often included, along with sleeping pills, in the sedative/hypnotic class of drugs. All the depressant drugs, including tranquilizers and painkillers, slow down the nervous system and can cause drowsiness, induce sleep, or relieve pain. In addition to acting on the nervous system, excess use of alcohol can have adverse effects on almost every other system of the body.

The chemical substance

The word alcohol, as commonly used, refers to beverage alcohol; its chemical name is ethanol or ethyl alcohol. It is produced by fermenting or distilling various fruits, vegetables, or grains. Pure ethyl alcohol is a clear, colourless liquid.

Methyl alcohol (methanol), another clear, colourless liquid, is very poisonous and should never be consumed. It cannot be made non-poisonous. As little as 1/2 oz. (15 ml) can cause blindness and 2 to 3 oz. (59 to 89 ml) can be fatal. Methyl alcohol is contained in paint removers, antifreeze, liquid fuel, lacquer thinner, and some industrial cleaning solutions.

So-called “non-beverage” alcohol is ethyl alcohol in a form that is not meant to be consumed. Products such as rubbing alcohol, Lysol® cleaner, vanilla extract, some mouthwashes, aftershave lotions, and cooking wines all contain high concentrations of ethyl alcohol. Despite the danger of overdose and toxic effects, alcoholics who cannot afford beverage alcohol often drink these products because they are so potent and often readily available. Numerous toxic effects can also result from other chemicals present in these preparations.

Beverage alcohol

In beverages, pure ethyl alcohol is diluted with various ingredients that affect the colour and consistency. Spirits such as whisky and gin usually contain 40% pure alcohol, table wine 12%, regular beer 5%, and spirit and wine-based coolers 5%. The usual serving (standard drink) contains 0.6 oz. (17 ml, 13.5 gm) of pure alcohol in the form of 1.5 oz. (45 ml) of spirits,

5 oz. (150 ml) of table wine, or 12 oz. (355 ml) of regular Canadian beer. The effect of alcohol does not depend on the alcoholic beverage but, rather, on the amount of pure ethyl alcohol consumed.

How alcohol works

After being consumed, alcohol is rapidly absorbed into the bloodstream from the stomach and small intestine. Food in the stomach delays the feeling of intoxication because it slows the absorption of alcohol in the stomach (which absorbs up to 20% of alcohol ingested) and delays passage of alcohol into the small intestine (where most absorption takes place). Because absorption is slowed, peak alcohol levels are also reduced, and the feeling of intoxication is not as great.

The effects of alcohol depend on how much is in the bloodstream—the blood alcohol concentration (BAC). The BAC determines how much depression of the nervous system will occur. The drinker's BAC depends on many factors, including the amount consumed in a given time, as well as the drinker's size, gender, and metabolism.

In the body, alcohol is broken down (metabolized) by enzymes present in the liver and stomach.

This usually occurs at a constant rate of about half a standard drink per hour. Women consuming the same amount of alcohol as men of the same weight have higher BAC because they have lower body water (0.55L/kg compared to 0.68L/kg). Because alcohol dissolves in cell membranes, it alters the function of many different cells, and therefore affects almost all organs and systems in the body. The depressant effect on the nervous system may in part result from an increase in the inhibitory effects of the chemical GABA, a neurotransmitter.

In large doses alcohol may affect a number of other chemicals in the nervous system, including acetylcholine, serotonin, and norepinephrine.

Drug effects

The effect of any drug, including alcohol, depends on the drug, the set, and the setting. The specific drug, the amount, and how it was taken all determine the effect. The set (what the person expects, and previous exposure of the body to this and other drugs) can alter effects. The setting, or location, user's mental state, and other drugs being used, can also influence drug effects.

For more information and to find an addiction services office near you, please call the 24-hour Helpline at 1-866-332-2322.

Alcohol increases stomach secretions, dilates blood vessels in the skin (causing loss of body heat despite a feeling of warmth), increases urine production, and even in small amounts can lead to accumulations of fat in liver cells.

The most obvious immediate effects of alcohol result from depression of the nervous system. Even the initial apparent stimulant effect actually results from depression of centres in the brain that inhibit our actions and restrain our behaviour.

After one drink, at a BAC of about 0.02 gram% (0.02 grams per 100 ml of blood), most people will feel more relaxed and possibly “loosened up” a little. Drinking more can make some people feel gregarious and possibly more self-confident, but others will become hostile, depressed and withdrawn.

At higher doses, even below a BAC of 0.08 (the legal limit for driving a car in Canada), thinking, judgment, and ability to estimate distances can be impaired and reaction times increased. At levels greater than 0.10, which will occur when a 160-lb. man consumes four or five drinks in an hour, significantly more impairment occurs. Studies have shown that drivers with a BAC of 0.10 are seven times more likely to cause a motor vehicle accident, because both performance and judgment are impaired.

At BACs over 0.20, the non-tolerant person is very intoxicated with pronounced motor incoordination (staggering gait, slurred speech). BACs above the range of 0.40 to 0.60 are usually fatal, typically from respiratory depression.

“Hangover” is the syndrome of fatigue, headache, nausea, and sometimes vomiting and shakiness occurring eight to 12 hours after a bout of heavy drinking ends. The hangover is in part caused by mild alcohol withdrawal, and so is partly suppressed by additional alcohol. Despite numerous “home remedies,” there is currently no effective cure for hangovers. The symptoms usually disappear within 24 hours as body systems return to normal.

Blackouts are periods of memory loss that occur while a person is drinking heavily. Although conscious and functioning, the person is later unable to recall what they did or said. Blackouts and morning drinking to treat hangovers are possible indicators of a drinking problem.

Death from alcohol overdose is often associated with heavy consumption over a short period of time at events where such consumption is encouraged—grad parties, bush parties, college initiations and drinking contests are some examples. Unconsciousness is one sign of possible alcohol overdose.

Any unconscious person, whether intoxicated or not, should be watched closely and should receive medical attention if they cannot be aroused.

Death may also occur when moderate amounts of alcohol are combined with other depressant drugs such as sleeping pills and tranquillizers. Even small amounts of alcohol when taken together with these or other drugs, such as cannabis or antihistamines (in cold, cough, and allergy remedies), can seriously impair a person’s ability to drive a car.

Moderate alcohol consumption

The possible beneficial effects of alcohol consumption have been studied. Moderate alcohol use (one to two drinks per day) may help prevent some types of heart disease in middle-aged and older adults. For women, however, the benefits of moderate consumption may be offset by a greater risk of breast cancer. Because heavy drinking is harmful to health and increases the risk of violence and accidents, encouraging alcohol consumption is not advisable as a preventive health measure. Better alternatives include safe, well-established methods such as eating sensibly, exercising regularly, and quitting smoking.

Nervous system

In addition to causing tolerance and withdrawal as discussed below, alcohol abuse affects the nervous system in other ways. It is a major cause of preventable brain injury resulting in severe dysfunction in up to 10% of alcohol abusers. In the late stages, Wernicke-Korsakoff syndrome can result in loss of brain function similar to what occurs in Alzheimer’s disease. Alcohol abuse can also seriously disrupt sleep and cause movement disorders, damage peripheral nerves, and lead to an increased risk of serious complications following head injury.

Gastrointestinal tract and digestive system

Serious disease of the liver and pancreas and damage to the stomach and intestines can result from chronic use of alcohol. When excessive alcohol intake is combined with poor eating habits, severe nutritional deficiencies can develop.

Chronic alcohol abuse is the single most frequent cause of illness and death from liver disease. The early accumulation of fat in the liver, called fatty liver, is generally reversible and requires no treatment except abstinence from alcohol and a good diet. The same treatment is given for alcoholic hepatitis, which usually follows a severe bout of heavy drinking resulting in death of liver cells. The late stage liver disease alcoholic cirrhosis is irreversible. In serious cases, a liver transplant may be required.

Chronic alcohol abuse can also cause disease of the pancreas (pancreatitis). Symptoms of pancreatitis include abdominal pain and vomiting. Diabetes can also result from pancreatitis, possibly requiring treatment with insulin. Bleeding from the stomach and from enlarged veins around the esophagus (esophageal varices), diarrhea and malabsorption of food can all occur in heavy drinkers.

Cardiovascular system

Abstinence from alcohol is critical in the treatment of the wide range of serious effects of alcohol abuse on the heart and blood vessels. In alcoholic cardiomyopathy, deterioration of the heart muscle leads to heart failure. Abnormal heart rhythms may explain in part the high incidence of sudden death in alcohol abusers.

Reproductive system and other hormonal effects

In men, chronic ingestion of excess alcohol may lead to impotence, sterility, atrophy of the testes, and enlargement of the breasts. Early menopause and menstrual irregularities are common in women who drink excessively. Excess output of hormones from the adrenal gland can occur and low levels of sex hormones can lead to premature bone loss (osteoporosis).

Metabolic effects

Acute alcohol abuse can cause low blood sugar, which is of particular concern for diabetic patients. Ketoacidosis, a condition involving excess acidity of the blood, can also be caused by excess alcohol use. This condition is more commonly seen in patients with diabetes.

Immune system and cancer-producing effects

Depression of the immune system caused by chronic alcohol abuse results in a predisposition to infections such as pneumonia and tuberculosis, and to cancer. In addition, increased risk of infection could occur if loss of judgment and inhibitions during intoxication resulted in unsafe sexual practices and in drug users sharing needles. Cancer of the throat, voice box (larynx), mouth, esophagus, and liver are the cancers most frequently associated with excessive use of alcohol. Less conclusive evidence of increased cancer exists for the stomach, large bowel, pancreas, lung, urinary tract, and breast.

Blood and muscle

Anemia is common in people who abuse alcohol. Abnormally large red blood cells (mean corpuscular volume greater than 100) occur

frequently. The level of platelets, which are important in the normal clotting of blood, is often low, but usually causes no clinical signs of a bleeding problem.

The profound weakness seen in chronic alcoholics may in part be caused by peripheral nerve damage, but also results from direct damage to muscles.

Alcohol and pregnancy

Mothers who consume alcohol during pregnancy are at an increased risk of having children with birth defects. FASD (fetal alcohol spectrum disorder) is a term that covers the full range of birth defects associated with alcohol consumption during pregnancy, including FAS (fetal alcohol syndrome) and FAE (fetal alcohol effects).

Fetal alcohol syndrome is a well-defined pattern of abnormalities. The diagnosis of FAS includes confirmation of drinking during pregnancy, and abnormalities in each of three categories: i) growth retardation, ii) central nervous system involvement such as hearing disorders, mental retardation, and brain malformations, and iii) characteristic face with narrow eye width, elongated, flattened midface, and thin upper lip.

The term fetal alcohol effects has come to mean a birth defect caused by alcohol ingestion during pregnancy in which some, but not all, of the symptoms related to FAS are present. FAE is not a milder form of fetal alcohol syndrome. Even though a child or adult with FAE has only some of the symptoms of fetal alcohol syndrome, those symptoms may have just as severe an effect on their life.

Tolerance and dependence

When continued exposure to excess alcohol occurs, the nervous system adapts to the presence of a chronic depressant and physical dependence develops. Indicators include tolerance (the need to consume more alcohol to obtain a desired effect) and the development of withdrawal symptoms if the user stops drinking. Because tolerance develops, many drinkers don't appear intoxicated even with increased consumption, and their deteriorating physical condition may go unrecognized. When hospitalized for other reasons and their alcohol intake stops abruptly, they experience withdrawal.

Psychological dependence is a poorly defined term used to describe the fact that heavy users may experience anxiety and even panic when alcohol is not available. In this case, the reaction results not from physical withdrawal, but because the user has become psychologically

accustomed to regular alcohol intake. Like physical dependence, this response can contribute to continued use of alcohol.

Withdrawal

Withdrawal symptoms often develop in three stages. The initial phase, which begins within a few hours after drinking stops, includes tremulousness (“the shakes”), irritability, nausea and vomiting, and difficulty sleeping. These symptoms reach peak intensity within 24 to 48 hours, and subside in two or three days. Alcoholic hallucinosis—very real “bad dreams” or actually seeing or hearing things that are not there—can occur during this phase.

In the second phase, convulsions (seizures, “rum fits”) can develop within 24 to 48 hours after stopping even heavier drinking. Convulsions have been reported to occur as long as five and up to 20 days later. Except in persons with epilepsy, the standard treatment of moderate to severe withdrawal described below is usually adequate.

Delirium tremens (DTs) are the third and most serious stage of alcohol withdrawal. They occur four or five days after prolonged, heavy drinking stops, at which time the person becomes severely agitated, extremely confused and disoriented, and has dilated pupils, fever, and a very rapid heart rate. Frightening hallucinations and bizarre delusions can also occur.

Reassurance and supportive nursing care in subdued surroundings are the basis for treating the alcohol withdrawal states. Chlordiazepoxide (Librium®), diazepam (Valium®), and other benzodiazepines are the drugs most commonly used. Particularly with DTs, electrolyte imbalances should be corrected and adequate fluids administered; hallucinations should be treated cautiously. Thiamine (vitamin B1) is usually given orally or intramuscularly to most patients treated for significant alcohol withdrawal.

Who uses alcohol?

A 2000 – 01 nationwide survey found that 76.6% of Albertans over the age of 12 were current drinkers (had consumed at least one drink in the previous year). This is similar to Canada’s national rate of 76.9%. The proportion of heavy drinkers in Alberta (22.5%) is higher than the rest of Canada (20.1%). Heavy drinking is defined as having consumed five or more drinks on one occasion, 12 or more times in the previous year.

Alcohol is also the drug most commonly used by Alberta youth. Among students in grades

7 to 12 surveyed in 2002, 56.3% reported alcohol use in the previous 12 months. The prevalence of alcohol use increases with age; 17.6% of students in Grade 7 reported using alcohol compared to 81.2% in Grade 12.

Alcohol and society

Alcohol misuse has a broad impact in society, undermining individual health, family and personal relationships, economic productivity, and community safety. Motor vehicle accidents are the leading cause of alcohol-related mortality, and alcohol consumption is a major contributing factor in injuries and fatalities resulting from falls, drowning and fires; work-related accidents, absenteeism and illness; and crimes of violence including spousal abuse and physical assault. The total cost of alcohol abuse in Alberta was estimated at \$749 million in 1992.

Alcohol and the law

There are many laws that regulate the manufacture, distribution, advertising, possession and consumption of alcohol. Alcohol legislation is a joint responsibility of the federal and provincial governments. In Alberta, it is an offence for anyone under 18 years of age to possess, consume or purchase alcohol. It is illegal to sell or supply alcohol to anyone known to be or appearing to be under the age of 18 (unless the person has proof otherwise). It is not illegal for parents or guardians to give an underage child a drink at home. Selling or supplying alcohol to any person who appears to be intoxicated is illegal. Under the Criminal Code, it is an offence to drive with a blood alcohol concentration (BAC) of 0.08% or greater, and to drive while impaired even if one’s BAC is less than 0.08%.

ADDITIONAL READING:

- Brands, B., Marshman, J. & Sproule, B. (1998). *Drugs & drug abuse: A reference text* (3rd ed.). Toronto, ON: Addiction Research Foundation.
- Canadian Centre on Substance Abuse (CCSA) & Centre for Addiction and Mental Health. (1999). *Canadian profile: Alcohol, tobacco and other drugs*. Ottawa, ON: CCSA.
- Clark, S. (2000, revised 2003). *Medical/physiological effects of alcohol*. Edmonton, AB: Alberta Alcohol & Drug Abuse Commission (AADAC).
- James, D. (1999). *Alberta profile: Social and health indicators of addiction*. Edmonton, AB: Alberta Alcohol & Drug Abuse Commission (AADAC).
- Kinney, J. & Leaton, G. (1995). *Loosening the grip* (5th ed.). St. Louis, MO: Mosby-Year Book, Inc.