Physiological Effects of Alcohol

This newsletter is the second in a two-part series on the physiological effects of alcohol.

This newsletter describes the physiological effects of chronic, or long-term, heavy drinking. A fine line separates heavy, or problem, drinkers from alcoholics. In most cases alcoholics are not skid-row bums; but instead may well be functioning members of a community—even if they are not functioning optimally. What follows are the physiological consequences of drinking large amounts of alcohol over a long period of time.

PART 2: CHRONIC EFFECTS

Tolerance

One result of chronic drinking is an increased tolerance to the effects of alcohol. A possible explanation for this increased ability to “hold one’s liquor” is that a particular set of liver enzymes is produced after prolonged drinking. These assist the enzymes that are normally present in metabolizing alcohol. As a result, alcohol is broken down more quickly and the individual has to drink increasingly greater amounts in order to attain the same degree of intoxication.

Tolerance to alcohol is not necessarily a healthy adaptation. Quite often this phenomenon produces a false sense of security in the heavy drinker. Chronic, heavy alcohol consumption can still cause damage to various tissues and organs at the same time that it is producing a tolerance in the drinker. On the other hand, injury to the liver resulting from continued heavy drinking may eventually reduce alcohol tolerance substantially, so smaller and smaller amounts of alcohol have the same intoxicating effect.

Dependence and Withdrawal

Prolonged drinking can lead to physical dependence on alcohol. Often physical alcohol dependence is evident only after the drinker suddenly abstains from drinking or greatly reduces his/her level of consumption. The sudden drop in intake causes a dependent drinker to experience “alcohol withdrawal syndrome,” beginning six to eight hours after he or she stops drinking. Mild effects are nausea, irritability, vomiting, sweating, and insomnia.

Funding in part provided by the City of Manhattan
If the individual progresses to full-blown alcohol withdrawal syndrome, blood pressure, heart rate, and body temperature go up, and he or she experiences visual, auditory and tactile hallucinations, severe confusion, heavy tremor involving the entire body, and possibly convulsions. This set of symptoms is known as delirium tremens (DT’s) and usually occurs 48 to 96 hours after drinking stops. DT’s are fatal up to 20 percent of the time.

**Liver Damage**

Because of its central role in detoxifying alcohol, the liver is a focal point of damage caused by chronic drinking. Liver disease from alcohol typically occurs in three stages: fatty liver, then hepatitis, and finally cirrhosis.

Alcohol consumption produces changes in the metabolism of lipids (fats) that can cause these compounds to accumulate in the liver cells, eventually producing an alcoholic “fatty liver.” Most often, there are no external signs of this ailment, but severe cases may include jaundice, abdominal pain, enlargement of the spleen, fluid retention, and injury to nervous tissue. This condition is usually reversible and shows rapid improvement with abstinence.

Hepatitis, literally “inflammation of the liver,” may develop if heavy drinking continues. In this stage of alcoholic liver disease, the liver is enlarged and tender, and jaundice is usually present. Hepatitis can persist for quite some time after the individual stops drinking completely, and there are a number of complications that can cause alcoholic hepatitis to be fatal.

Alcoholic liver cirrhosis, the most advanced stage of alcoholic liver disease, is an inflammatory condition in which scar tissue replaces functioning liver cells. Though alcoholic cirrhosis normally follows fatty liver and hepatitis, it can also occur without any previous liver disease. When cirrhosis occurs, further drinking will worsen the situation. If allowed to progress, cirrhosis of the liver ultimately will be fatal. Because of the importance of the liver to the body’s metabolic system, alcohol’s damage to this organ may have far reaching consequences for many other tissues and organs.

**Effects on digestion and nutrition**

The digestive tract suffers numerous direct and indirect injuries with chronic drinking. Severe vomiting causes tears in the lining of the esophagus, and complications associated with liver disease can also cause this lining to rupture and bleed. Moreover, alcohol appears to have a toxic effect on the lining of the small intestine, the major area of food absorption. The result of this is reduced absorption of certain nutrients. Changes in the intestinal lining may also contribute to diarrhea in heavy drinkers.

The pancreas may become inflamed with long-term alcohol abuse. If persistent pancreatitis occurs, intoxication, especially after periods of abstinence, can irritate the already-impaired organ, producing abdominal pain that typically lasts for days.

Overall nutritional deficiency is a serious hazard that can be brought on by heavy alcohol intake in several ways. Alcohol itself is high in calories, but these are “empty” calories; no vitamins or minerals accompany them. Thus, malnutrition often accompanies heavy alcohol use. Vomiting and diarrhea add to the nutritional shortage.
Effects on the Nervous System

Wernicke’s encephalopathy is a neurological disorder caused by a thiamin deficiency that is often a result of chronic excessive alcohol consumption. This disease of the central nervous system produces confusion, difficulty in walking, and disturbances of the muscles that control eyeball movement. Eighty percent of individuals with this disorder also have disorders of the peripheral nerves, so that they experience burning, tender feet and hands, but are insensitive to light touch. Wernicke’s encephalopathy represents potential serious brain damage and may be fatal if the individual does not receive large doses of thiamin. Most patients who recover are left with a permanent condition known as Korsakoff’s psychosis. In Korsakoff’s psychosis, the person suffers severe amnesia, especially for recent events. He or she is left apathetic, passive, lacking emotion and initiative.

Heart and Circulatory Effects

Evidence reveals that chronic consumption of alcohol can lower the contractile forces of the heart, and may contribute to congestive heart failure. Typically in this disorder, known as “alcoholic cardiomyopathy,” the heart is enlarged and weakened and the individual experiences unusual fatigue with physical effort. Heavy, prolonged use of alcohol also has been associated with high incidences of high blood pressure and stroke.

Muscular Disorders

Skeletal muscles can show weakness and even deterioration with chronic drinking. “Alcoholic myopathy” (muscle disease) may show up as an acute attack with muscular pain, tenderness, and weakness, usually confined to one limb or a group of muscles. Alcoholic myopathy may also be chronic, that is, extended over a long period of time, with a slow progression of muscular weakness and atrophy or wasting away.

Endocrine Effects

Diuresis, or increased urination, is an example of an immediate effect of alcoholic intoxication on hormonal activity. Long-term, heavy alcohol consumption can upset the functioning of the endocrine system in several other ways. In men, chronic consumption can cause levels of estrogen, a female hormone, to increase while bringing levels of testosterone, a male hormone, down. The net result is that advanced male alcoholics often show signs of feminization, or female physical characteristics. Additionally, chronic alcohol intake seems to have a direct harmful effect on the testes and their normal function. Excessive alcohol intake has been shown to be significantly involved in impotence in males. In women, endocrine effects of chronic drinking include disturbances in menstruation and even failure of the ovaries to function.
Cancer and Disease

Chronic alcohol consumption does show an apparent involvement in a number of forms of cancer, including cancers of the mouth, upper respiratory tract, esophagus, liver, pancreas, large intestine and rectum. It is interesting to note that cirrhosis is present in 70 to 90 percent of all liver cancer patients.

Consumption of beer shows a higher association than other forms of alcohol with cases of rectal and colon cancer. Researchers think that beer may concentrate carcinogens in the gut by influencing both the bacterial and chemical balance.

Birth Defects

Most research suggests that alcohol has a direct toxic effect on the developing embryo or fetus during pregnancy. For example, alcohol consumption, even in moderate amounts, appears to be associated with higher rates of spontaneous abortion.

In 1973 researchers began labeling a recognizable set of alcohol-related birth defects called “Fetal Alcohol Syndrome.” FAS is identified by birth defects such as growth deficiencies, facial abnormalities, mental retardation, and malformations of the genitals, heart, urinary system, and skeleton. FAS does not seem to be an all-or-none condition. Sometimes children of alcoholic women do not show complete FAS, but show a partial set of characteristics, such as low birth weight, heart defects, and learning deficits, also known as Fetal Alcohol Effects (FAE). Research suggests that mother malnutrition and/or physiological damage to the reproductive or other systems from excessive drinking plays a role in FAS. Also, heavy alcohol consumption decreases milk ejection. Alcohol readily enters breast milk, and is thus ingested by a nursing infant.