Alcoholic Beverage Consumption

CAS No.: none assigned

Known to be a human carcinogen

First listed in the *Ninth Report on Carcinogens* (2000)

Carcinogenicity

Consumption of alcoholic beverages is *known to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in humans.

Cancer Studies in Humans

Studies indicate that the risk of cancer from consumption of alcoholic beverages is most pronounced among smokers and at the highest levels of consumption. Consumption of alcoholic beverages has been shown to cause cancer of the mouth, pharynx, larynx, and esophagus. Cohort and case-control epidemiological studies in a variety of human populations are consistent in reporting moderate to strong associations between alcohol consumption and cancer at these four sites, and the risk of cancer increases with increasing consumption level. The effect of a given level of alcoholic beverage intake on the absolute risk of cancer at these four tissue sites is influenced by other factors, especially smoking. However, smoking does not explain the observed increased risk of cancer associated with increased alcoholic beverage consumption. Evidence also supports a weaker, but possibly causal, relationship between alcoholic beverage consumption and cancer of the liver and breast (IARC 1988, Longnecker 1994, Longnecker and Enger 1996).

Since alcoholic beverage consumption was reviewed for listing in the *Ninth Report on Carcinogens* in 2000, the International Agency for Research on Cancer has reevaluated the evidence for the carcinogenicity of alcoholic beverage consumption (Baan *et al.* 2007, Secretan *et al.* 2009) and concluded that there was sufficient evidence of carcinogenicity in humans. The 2007 and 2009 reviews concluded that alcoholic beverage consumption caused cancer of the mouth, pharynx, larynx, esophagus, liver, colorectum, and female breast.

Cancer Studies in Experimental Animals

No adequate studies of the carcinogenicity of alcoholic beverages in experimental animal have been reported. The results of studies specifically examining the carcinogenicity of ethanol in experimental animals do not suggest that the ethanol component of alcoholic beverages is solely responsible for the increased risk of cancer associated with human consumption of alcoholic beverages.

Studies on Mechanisms of Carcinogenesis

The mechanism by which consumption of alcoholic beverages causes cancer in humans has not been established. Increased frequencies of chromosomal aberrations, sister chromatid exchange, and aneuploidy were found in the peripheral-blood lymphocytes of alcoholics. Ethanol-free extracts of some alcoholic beverages caused mutations in bacteria and sister chromatid exchange in cultured human cells (IARC 1988).

Properties

Ethanol and water are the main constituents of most alcoholic beverages. Based on the standard measures for most drinks, the amount of ethanol consumed is similar for beer, wine, and spirits (10 to 14 g). Beer, wine, and spirits also contain volatile and nonvolatile flavor compounds that originate from raw materials, fermentation, wooden casks used for maturation, and synthetic substances added to specially flavored beverages. Although the exact composition of many alcoholic beverages is confidential business information, many studies have identified the organic compounds typically present at low levels. Several of the components and contaminants identified in beer, wine, and spirits are known or suspected human carcinogens, including acetaldehyde, nitrosamines, aflatoxins, ethyl carbamate (urethane), asbestos, and arsenic compounds (IARC 1988).

Use

Alcoholic beverages have been made and used by most societies for thousands of years (IARC 1988). Consumption trends, including overall level of alcohol consumption, beverage choice, age and sex differences, and temporal variations, differ among and within societies. In many cultures, alcohol also has been used in medicine and various pharmaceutical preparations, in religious observances, and in feasting and celebrations.

Production

All alcoholic beverages are produced by the fermentation of fruit or other vegetable matter. Most commercial and home production is of fermented beverages that are classified, based on raw materials and production methods used, as beer, wine, or distilled spirits; smaller quantities of other kinds of fermented beverages (e.g., cider, rice wine, palm wine) also are produced. Beer is produced by fermentation of malted barley or other cereals with the addition of hops. Wine is made from fermented grape juice or crushed grapes; fortified wines include additional distilled spirits. Distilled spirits originate from sources of starch or sugar, including cereals, molasses from sugar beets, grapes, potatoes, cherries, plums, and other fruits; after sugar fermentation, the alcohol content is increased by means of liquid distillation. Although ethanol can be chemically synthesized from ethylene, the alcoholic beverage industry does not synthesize alcohol for use in beverages, because of the presence of impurities from the synthetic process (IARC 1988).

In 2016, the United States produced 7.1 billion gallons of beer, 1 billion gallons of wine, and 652 million gallons of distilled spirits (Park Street 2019). In 2017, the volume of U.S. imports of alcoholic beverages greatly exceeded the volume of exports. Imports totaled about 1 billion gallons of beer, over 300 million gallons of wine, and about 200 million proof gallons of distilled spirits, while exports totaled about 180 million gallons of beer, 89 million gallons of wine, and 89 million proof gallons of distilled spirits (USITC 2019).

Exposure

According to the National Survey on Drug Use and Health (SAMHSA 2017), approximately half the U.S. population (51.7%, or 140.6 million people) reported current use of alcohol (defined as least one drink in the past 30 days) in 2017, a decrease from the 72.9% reported in 1979 (SAMHSA 2009). The percentage of the U.S. population reporting current alcohol use remained steady from 2002 to 2017, while the percentage of adolescents (aged 12 to 17) using alcohol decreased from 2002 (17.6%) to 2017 (9.9%). In the 2017 survey, 24.5% of the U.S. population (66.6 million people) reported binge drinking, defined as having 5 or more drinks (males) or 4 or more drinks (females) on the same occasion at least once in the past month, and 6.1% (16.7 million people) reported heavy alcohol use (defined as binge drinking on 5 or more days in the past month). Both binge and heavy drinking were most prevalent among young adults (aged 18 to 25); in this age group, 36.9% reported binge drinking, and 9.6% reported heavy drinking.

Historically, annual per-capita U.S. alcohol consumption (expressed as gallons of ethanol per year) increased steadily from the late 1950s (1.98 gal in 1958) to peak at 2.76 gal in 1981 (Haughwout

and Slater 2018). Consumption then decreased at about the same rate, to a low of 2.15 gal in 1998, before increasing more gradually to 2.35 gal in 2016. Throughout this period, the largest percentage of ethanol consumed was from beer, and the smallest was from wine. The increase in per-capita alcohol consumption from 1958 to 1981 was led by increased consumption of wine, and the decrease from 1982 to 1998 was led by decreased consumption of distilled spirits. From 1999 to 2016, the increase in alcohol consumption was due mainly to increased consumption of wine and distilled spirits, while beer consumption continued to decrease. In 2016, 46% of total U.S. alcohol consumption was from beer, 35% from distilled spirits, and 19% from wine.

Regulations

Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF, Dept. of Justice)

Alcoholic beverages sold or distributed in the United States, or to members of the Armed Forces outside the United States, must contain a specified health-warning label.

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