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DETECTION OF ALCOHOL EUPHORIA IN FORENSIC SCIENCE

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ABSTRACT

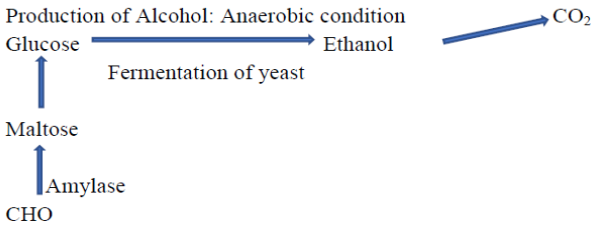
When you drink alcohol, it goes into your stomach and small intestine. It gets absorbed into your blood, which carries it through your body and into your brain and lungs. You exhale it when you breathe. A breath alcohol test measures how much alcohol is in the air you breathe out. The device uses that measurement to estimate how much alcohol is in your blood. That number is known as your BAC, or blood alcohol content. It may go up as soon as 15 minutes after drinking. BAC is usually highest about an hour after you drink.Why Is It Used? As your BAC rises, you can get clumsy and take longer to react. You may not make good choices, either. These things make driving dangerous. In every state but one, it's illegal for a driver over the age of 21 to have a BAC above 0.08%. As of December 2018, Utah's BAC level will be 0.05%. All states have zero tolerance laws for drivers under 21. If you're speeding, in an accident, or weaving on the road, local police may suspect you of driving under the influence, or DUI. They can use a device known as a Breathalyzer to test your BAC right at the scene of an accident or on the side of the road if they pull you over.Are There Different Kinds of Tests? Tests can also be manual or electronic. Most police use an electronic device about the size of a walkie–talkie. You blow into a mouthpiece and it gives an immediate reading. You may be asked to repeat this a few times so the officer can get an average reading. It takes about a minute and it doesn't hurt. The most common manual test includes a balloon and a glass tube filled with yellow crystals. You blow into the balloon and release the air into the tube. The bands of crystals in the tube change color from yellow to green depending on how much alcohol is in your system. Check the instructions included with the device to read results. Generally, one green band means your BAC is under 0.05%, which is within the legal limit to drive. Two green bands indicate that your BAC is between 0.05% and 0.10% and three bands means it's over 0.10%. You can buy either type of test for yourself if you want to make sure you're safe before you get behind the wheel. The manual ones are less expensive.Is It Accurate? Not always. There are a few things that could cause an error in the reading. If you had a drink 15 minutes before the test, trace amounts of alcohol in your mouth could lead to an inaccurate result. Smoking can also affect results. So can products that contain alcohol, like mouthwash and breath fresheners. Sometimes the machines need to be recalibrated or have batteries replaced. These possibly could affect the reading. Some tests have software that needs to be updated occasionally and can cause glitches. Professional breath alcohol tests, like the ones police officers carry, use fuel cell technology. They're the most accurate. But no breath test is as accurate as a blood or urine test. Things That Affect BAC: How fast your BAC rises and how long it says that way depend on several things: Your weight. The heavier you are, the more water is in your body. The more water, the more the alcohol gets diluted. Your gender. Alcohol doesn't affect men and women the same. Men have higher levels of a stomach enzyme that helps break down alcohol, so they process it faster. Women typically have less water and more fat. Hormonal changes in women also can affect the BAC. How many drinks you had, how strong they were and how fast you drank them. The more you drink each hour, the faster your BAC rises. How much you ate. A full belly, especially high–protein foods, will slow the processing of alcohol. What Do the Results Mean? If a police officer gives you a breath alcohol test and your BAC is over the legal limit of 0.08%, you may be arrested and charged with driving under the influence. You also may be asked to provide a blood or urine sample for further testing to determine a more accurate BAC.

KEYWORDS: - Blood Alcohol Content, Breath Alcohol Content, Estimated Peak Blood Alcohol Concentration, Standard Drinks, Body Water Constant, Body Weight, Metabolism Constant, Drinking Period.

Overview: Euphoria is meant by cloud nine, ecstasy, elatedness, elation, exhilaration, heaven, high, intoxication, paradise, rapture, rhapsody, seventh heaven, swoon, transport produced by wine. Wine is an alcoholic drink typically made from fermented grapes. Yeast consumes the sugar in the grapes and converts it to ethanol, carbon dioxide and heat. Different varieties of grapes and strains of yeasts are major factors in different styles of wine. These differences result from the complex interactions between the biochemical development of the grape, the reactions involved in fermentation, the grape's growing environment (terroir), and the wine production process. Many countries enact legal appellations intended to define styles and qualities of wine. These typically restrict the geographical origin and permitted varieties of grapes, as well as other aspects of wine production. Wines not made from grapes involve fermentation of additional crops, including rice wine and other fruit wines such as plum, cherry, pomegranate, currant and elderberry. Wine has been produced for thousands of years. The earliest evidence of wine is from ancient China (c. 7000 BC), Georgia (6000 BC), Persia (5000 BC), and Italy (4000 BC). New World wine has some connection to alcoholic beverages made by the indigenous peoples of the Americas, but is mainly connected to later Viking area of Vinland and Spanish traditions in New Spain. Later, as Old-World wine further developed viticulture techniques, Europe would encompass three of the largest wine-producing regions. Today, the five countries with the largest wine-producing regions are in Italy, Spain, France, the United States, and China. Alcoholism is, broadly, any drinking of alcohol that results in significant mental or physical health problems. Alcoholism is not a recognized diagnostic entity. Predominant diagnostic classifications are alcohol use disorder (DSM-5) or alcohol dependence (ICD-11). Excessive alcohol use can damage all organ systems, but it particularly affects the brain, heart, liver, pancreas and immune system. Alcoholism can result in mental illness, delirium tremens, Wernicke–Korsakoff syndrome, irregular heartbeat, an impaired immune response, liver cirrhosis and increased cancer risk. Drinking during pregnancy can result in fatal alcohol spectrum disorders. Women are generally more sensitive than men to the harmful effects of alcohol, primarily due to their smaller body weight, lower capacity to metabolize alcohol, and higher proportion of body fat. In a small number of individuals, prolonged, severe alcohol misuse ultimately leads to frank dementia. Environmental factors and genetics are two factors affecting risk for alcoholism, with about half the risk attributed to each. Someone with a parent or sibling with alcoholism is three to four times more likely to become an alcoholic themselves, but only a minority of them do. Environmental factors include social, cultural and behavioral influences. High stress levels and anxiety, as well as alcohol's inexpensive cost and easy accessibility, increase the risk. People may continue to drink partly to prevent or improve symptoms of withdrawal. After a person stops drinking alcohol, they may experience a low level of withdrawal lasting for months. Medically, alcoholism is considered both a physical and mental illness. Questionnaires are usually used to detect possible alcoholism. Further information is then collected to confirm the diagnosis. Mostly used beverages: Red wine, White wine, Rose wine, Orange wine, Sparkling wine, Dessert wine, Fruit wine, Honey wine, Starch wine, Vintage, Cocktail, Mocktail, Vodka, Beer, Scotch.

Alcohol: Ethanol [CAS: 64-17-5] (also called ethyl alcohol, grain alcohol, drinking alcohol, or simply alcohol) is an organic chemical compound. It is a simple alcohol with the chemical formula C_2H_6O. Its formula can be also written as $CH_3{-}CH_2{-}OH$ or C_2H_5OH (an ethyl group linked to a hydroxyl group), and is often abbreviated as EtOH. Ethanol is a volatile, flammable, colorless liquid with a slight characteristic odor. It is a psychoactive drug, recreational drug, and the active ingredient in alcoholic drinks. Wine has long played an important role in religion. Chemically known as ethanol. Has played many roles throughout history. Considered a food, because it contributes energy to the diet (7 kcals/gram). Not considered a nutrient, because is not needed. Social stimulant: removes inhibitions. Has been a thirst quencher where water is unsafe, and an analgesic to treat aches and pains.[1]

Production of Alcoholic Beverages: Fermentation: the breakdown of carbohydrates without the use of oxygen. Alcohol, carbon dioxide, and various acids are byproducts. High carbohydrate foods especially encourage the growth of yeast, the micro-organism that is responsible for alcohol production.



Production of beer: CHO must be simple sugar, such as maltose or glucose in order for the yeast to use it as food. If the CHO is a starch, such as that found in cereal grains (barley) it must be broken down to simpler forms, or malted. Beer is made from malted cereal grains, such as barley, flavored with hops and brewed by slow fermentation. Resulting CO_2 is used to carbonate the beer.

Production of Distilled Spirits: Distilled spirits such as whiskey, vodka, or gin are made by distilling the alcohol after fermentation. Distilling separates the alcohol from water and the alcohol is recovered. Vodka and gin are unaged. Whiskey, rum and brandies are aged.[2]

Figure 1: Red Wine, White Wine & Rose Wine.

Alcohol absorption: Depends on rate of stomach emptying. Absorbed readily by simple diffusion (no digestion needed)

Higher proof → faster absorption. Wine is faster absorbed than liquor which is faster than beer. Food slows absorption from the stomach. Easily moves through the cell membrane (damaging it) → gastritis. Alcohol is found wherever water is found in the body.

Figure 2: Orange Wine, Fruit Wine & Champagne.

Drinking enough to cause a blood alcohol concentration (BAC) of 0.03–0.12% typically causes an overall improvement in mood and possible euphoria (a "happy" feeling), increased self-confidence and sociability, decreased anxiety, a flushed, red appearance in the face and impaired judgment and fine muscle coordination. A BAC of 0.09% to 0.25% causes lethargy, sedation, balance problems and blurred vision. A BAC of 0.18% to 0.30% causes profound confusion, impaired speech (e.g. slurred speech), staggering, dizziness and vomiting. A BAC from 0.25% to 0.40% causes stupor, unconsciousness, anterograde amnesia, vomiting (death may occur due to inhalation of vomit while unconscious) and respiratory depression (potentially life-threatening). A BAC from 0.35% to 0.80% causes a coma (unconsciousness), life-threatening respiratory depression and possibly fatal alcohol poisoning. With all alcoholic beverages, drinking while driving, operating an aircraft or heavy machinery increases the risk of an accident; many countries have penalties for drunk driving.[3]

Figure 3: Beer, Vodka & Scotch.

Long-term effects: Having more than one drink a day for women or two drinks for men increases the risk of heart disease, high blood pressure, atrial fibrillation, and stroke. Risk is greater with binge drinking, which may also result in violence or accidents. About 3.3 million deaths (5.9% of all deaths) are believed to be due to alcohol each year. Alcoholism reduces a person's life expectancy by around ten years and alcohol use is the third leading cause of early death in the United States. No professional medical association recommends that people who are non-drinkers should start drinking. Long-term alcohol misuse can cause a number of physical symptoms, including cirrhosis of the liver, pancreatitis, epilepsy, polyneuropathy, alcoholic dementia, heart disease, nutritional deficiencies, peptic ulcers and sexual dysfunction, and can eventually be fatal. Other physical effects include an increased risk of developing cardiovascular disease, malabsorption, alcoholic liver disease, and several cancers. Damage to the central nervous system and peripheral nervous system can occur from sustained alcohol consumption. A wide range of immunologic defects can result and there may be a generalized skeletal fragility, in addition to a recognized tendency to accidental injury, resulting a propensity to bone fractures. Women develop long-term complications of alcohol dependence more rapidly than do men. Additionally, women have a higher mortality rate from alcoholism than men. Examples of long-term complications include brain, heart, and liver damage and an increased risk of breast cancer. Additionally, heavy drinking over time has been found to have a negative effect on reproductive functioning in women. This results in reproductive dysfunction such as anovulation, decreased ovarian mass, problems or irregularity of the menstrual cycle, and early menopause. Alcoholic ketoacidosis can occur in individuals who chronically misuse alcohol and have a recent history of binge drinking. The amount of alcohol that can be biologically processed and its effects differ between sexes. Equal dosages of alcohol consumed by men and women generally result in women having higher blood alcohol concentrations (BACs), since women generally have a lower weight and higher percentage of body fat and therefore a lower volume of distribution for alcohol than men.[4]

Alcohol (Ethanol) Metabolism: Depends on gender, race, size, food, physical condition, alcohol content. Metabolism depends on alcohol dehydrogenase (ADH). Alcoholics and women have less ADH. Majority of the ethanol is metabolized by the liver.

Alcohol and Drugs: Alcohol cannot be stored and has priority in metabolism. If taken with sedatives, alcohol and sedatives compete for the same metabolic pathways. Liver cannot metabolize the sedatives fast enough → coma or death.

Alcohol (Ethanol) Metabolism: Social drinker who weighs 150 pounds with normal liver function metabolizes about 5-7 grams of alcohol her hour, about half a beer of ¼ of another drink. When intake of alcohol exceeds liver's ability to metabolize it, builds up in the bloodstream. Small percentage excreted in urine, sweat, expired air (levels in expired air correspond with blood alcohol content → Breathalyzer test).

A breathalyzer (breath and analyzer) is a device for estimating blood alcohol content (BAC) from a breath sample. Breathalyzer is the brand name for the instrument that tests the alcohol level developed by inventor Robert Frank Borkenstein (August 31, 1912–August 10, 2002) was an American police officer and scientist, and inventor of the Breathalyzer. It was registered as a trademark on May 13, 1954, but many people use the term to refer to any generic device for estimating blood alcohol content.[5]

Figure 4: Robert Frank Borkenstein (Breathalyzer inventor) and Emil Bogen (BAC discoverer).

Francis edmund anstie (11 December 1833–12 September 1874) was an English doctor, medical author and journalist. He was the first editor of medical journal The Practitioner, established in 1868. He is notable for proposing Anstie's limit, an amount of alcohol that could be consumed daily with no ill effects also, in 1927 a

Chicago chemist, **William duncan McNally** (8 July 1882–29 June 1961), invented a breathalyzer in which the breath moving through chemicals in water would change color.

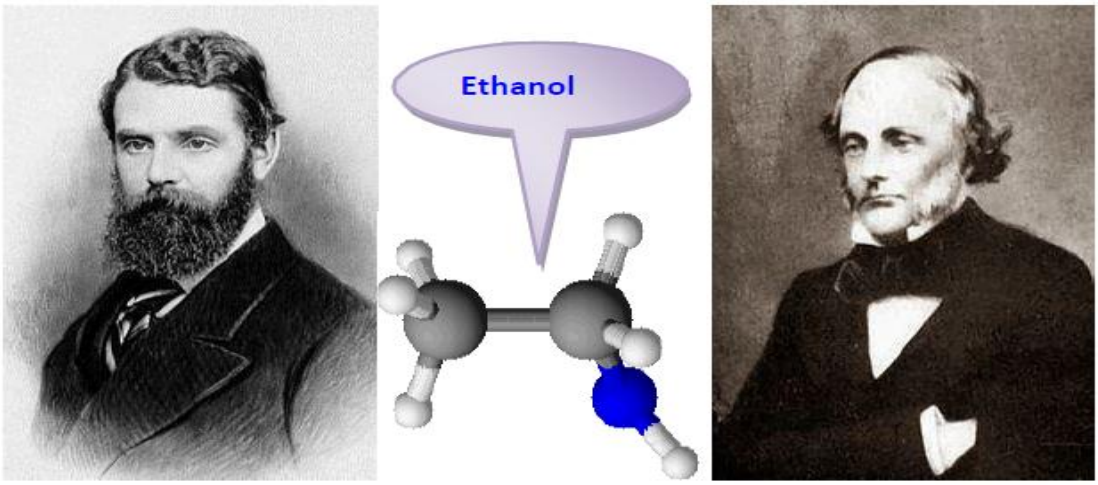


Figure 5: Francis E. Anstie (Alcohol detection scientist) and William Duncan McNally (Breathalyzer inventor).

One use for his invention was for housewives to test whether their husbands had been drinking. He was the chief chemist in the Cook County Department of Public Health and the chief chemist for the Cook County Medical Examiner's office. He invented an early breathalyzer in 1927.[6]

Chemistry: This is based on oxidation–reduction reaction. When the user exhales into a breath analyzer, any ethanol (CH_3CH_2OH) present in their breath is oxidized to acetic acid at the anode: $CH_3\,CH_2\,OH\ (gas)+H_2O(liquid)\rightarrow CH_3COOH\ (liquid)+4H^+_{(aqueous)}+4e^-$. This acetic acid is converted into carbonic acid (H_2CO_3) by aerial oxidation which after breakdown produces carbon dioxide (CO_2) and water (H_2O) and chemical energy in Joules is recorded in breathalyzer instrument.

$CH_3\,COOH\ (liquid)+2O_2(gas)\rightarrow 2H_2CO_3(liquid)$

$2H_2\ CO_3\ (liquid)\rightarrow\ 2CO_2(gas)+2H_2O(liquid)+Chemical\ energy\ (Joules)$

At the cathode, atmospheric oxygen is reduced:

$O_2\,(gas)+4H^++4e^-\rightarrow 2H_2O(liquid).$

The overall reaction is the oxidation of ethanol (CH_3CH_2OH) to acetic acid (CH_3COOH) and water (H_2O).

$CH_3CH_2OH\ (liquid)+O_2(gas)\rightarrow CH_3COOH(aqueous)+H_2O(liquid)$

The reaction releases proton (H^+) and electron (e^-) which again consumed in next step process. The electric current produced by this reaction is measured by a microcontroller and displayed as an approximation of overall blood alcohol content (BAC) by the Alco sensor.

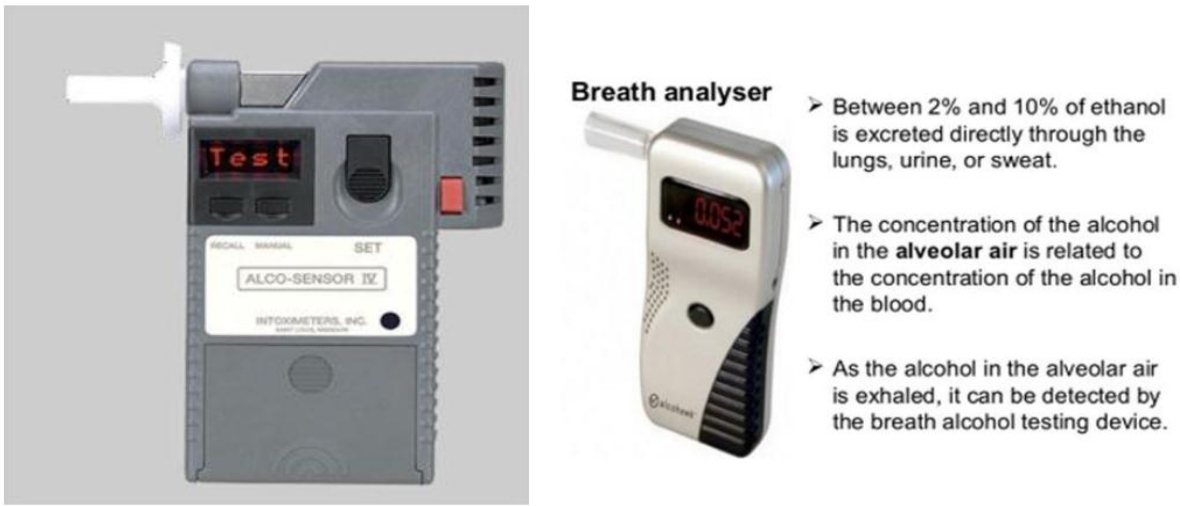


Figure 6: Alco Sensor [Breath analyzer].

Blood alcohol content (BAC), also called blood alcohol concentration, blood ethanol concentration, or blood alcohol level, is most commonly used as a metric of alcohol intoxication for legal or medical purposes. Blood alcohol concentration is usually expressed as a percentage of ethanol in the blood in units of mass of

alcohol per volume of blood or mass of alcohol per mass of blood, depending on the country. To calculate estimated peak blood alcohol concentration (EBAC), a variation, including drinking period in hours, of the Widmark formula was used. The formula is: **EBAC= [{(0.806×SD×1.2)/BW×Wt}–MR×DP]×10**. Where: (a) 0.806 is a constant for body water in the blood (mean 80.6%). (b) SD is the number of standard drinks, that being 10 grams of ethanol each (c) 1.2 is a factor to convert the amount in grams to Swedish standards set by The Swedish National Institute of Public Health (d) BW is a body water constant (0.58 for males and 0.49 for females) (e) Wt is body weight (kilogram) (f) MR is the metabolism constant (0.015 for males and 0.017 for females) and (g) DP is the drinking period in hours. 10 converts the result to permillage (Per mille: parts per thousand) of alcohol.[7]

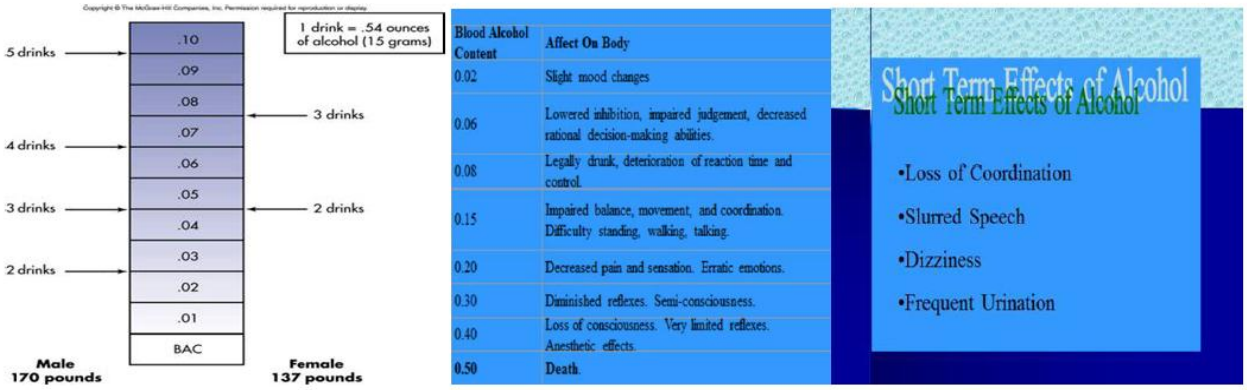


Figure 7: Blood alcohol content.

Regarding metabolism (MR) in the formula; Females demonstrated a higher average rate of elimination (mean: 0.017; range: 0.014–0.021g/210L) than males (mean: 0.015; range: 0.013–0.017g/210L). Female subjects on average had a higher percentage of body fat (mean: 26.0; range: 16.7–36.8%) than males (mean: 18.0; range: 10.2–25.3%). Additionally, men are, on average, heavier than women but it is not strictly accurate to say that the water content of a person alone is responsible for the dissolution of alcohol within the body, because alcohol does dissolve in fatty tissue as well. When it does, a certain amount of alcohol is temporarily taken out of the blood and briefly stored in the fat. For this reason, most calculations of alcohol to body mass simply use the weight of the individual and not specifically his/her water content. Finally, it is speculated that the bubbles in sparkling wine may speed up alcohol intoxication by helping the alcohol to reach the bloodstream faster.[8]

Women and Alcohol: Women absorb and metabolize alcohol differently than men. Have less activity of ADH; metabolize only 10% of alcohol in stomach lining vs 30% by men. Have less body water in which to dilute the alcohol than men do. When men and women of equal size drink equal amounts of liquor, more alcohol reaches the bloodstream in women. Women develop alcohol-related ailments such as cirrhosis more quickly than men with the same drinking habits. National Institute on Alcohol Abuse and Alcoholism defines heavy drinking as the consumption of 4 or more drinks a day or at least 15 drinks per week in men, or 3 or more drinks a day or at least 8 drinks per week in women.

BLOOD ALCOHOL CONTENT (BAC)
Table for Male (M) / Female (F)

Number of Drinks		Body Weight in Pounds								Driving Condition
		100	120	140	160	180	200	220	240	
0	M	.00	.00	.00	.00	.00	.00	.00	.00	Only Safe Driving Limit
	F	.00	.00	.00	.00	.00	.00	.00	.00	
1	M	.06	.05	.04	.04	.03	.03	.03	.02	Driving Skills Impaired
	F	.07	.06	.05	.04	.04	.03	.03	.03	
2	M	.12	.10	.09	.07	.07	.06	.05	.05	
	F	.13	.11	.09	.08	.07	.07	.06	.06	
3	M	.18	.15	.13	.11	.10	.09	.08	.07	
	F	.20	.17	.14	.12	.11	.10	.09	.08	Legally Intoxicated
4	M	.24	.20	.17	.15	.13	.12	.11	.10	
	F	.26	.22	.19	.17	.15	.13	.12	.11	
5	M	.30	.25	.21	.19	.17	.15	.14	.12	
	F	.33	.28	.24	.21	.18	.17	.15	.14	

Subtract .01% for each 40 minutes that lapse between drinks.
1 drink = 1.5 oz. 80 proof liquor, 12 oz. 5% beer, or 5 oz. 12% wine.
Fewer than 5 persons out of 100 will exceed these values.

Figure 8: Alcohol content.

Unhealthy drinking patterns such as heavy drinking and binge drinking may be signs of alcoholism. Women who drink excessively are at increased risk for damage to the heart muscle at lower levels of consumption and over fewer years of drinking than men. Breast and other Cancers: Alcohol consumption increases the risk of cancers of the mouth, throat, esophagus, liver, and colon.

Table 1: BAC values in Male/Female.

BAC (% by volume)	Behavior	Impairment
0.001–0.029	Average individual appears normal	Subtle effects that can be detected with special tests
0.030–0.059	Mild euphoria, Relaxation, Joyousness, Talkativeness, Decreased inhibition	Concentration
0.060–0.099	Blunted feelings, Reduced sensitivity to Euphoria, Disinhibition, Extraversion	Reasoning, Depth perception, Peripheral vision, Glare recovery
0.100–0.199	Over–expression, Boisterousness, Possibility of nauseaand vomiting	Reflexes, Reaction time, Gross motor control,Staggering, Slurred speech, Temporary erectile dysfunction
0.200–0.299	Nausea, Vomiting, Emotional swings, Anger or sadness, Partial loss of understanding, Impaired sensations, Decreased libido, Possibility of stupor	Severe motor impairment, Loss of consciousness,Memory blackout
0.300–0.399	Stupor, CNS depression, Loss of understanding, Lapses in and out of consciousness, Low possibility of death	Bladder function, Breathing, Disequilibrium, Heart rate
0.400–0.500	Severe CNS depression, Coma, Possibility of death	Breathing, Heart rate, Positional alcohol nystagmus
>0.50	High possibility of death	

Figure 9: Cocktail Party in Alcohol in World & World in Alcohol.

Moderate alcohol use: Men – 1 or 2 drinks daily. Women – 1 drink daily. Difference due to Body size/blood volume.

Differences in body composition and water content. Differences in metabolism.

Alcohol abuse: Contributes to the leading causes of death. Combined with tobacco, increases the risk for esophageal and oral cancer. Risk for heart disease, heart arrhythmia, HTN, stroke, osteoporosis, brain damage, colorectal cancer, breast cancer, nutritional deficiencies, fetal damage, obesity, cancer.[9]

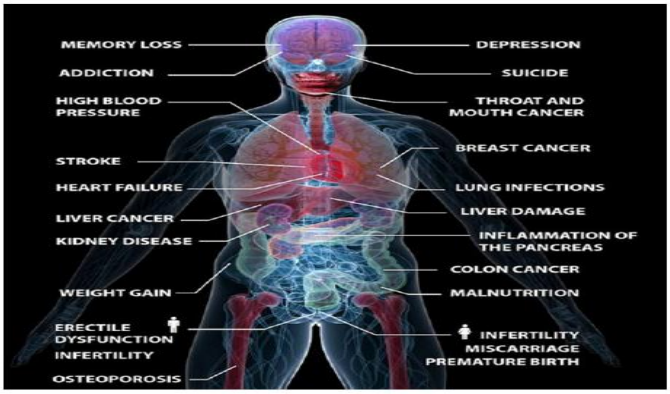


Figure 10: Health effects.

Health effects of alcohol: Pancreas – inflammation (pancreatitis). Small intestine – rapid absorption with/without food
Liver – major site of metabolism: 80% via ADH, 10% MEOS (microsomal ethanol oxidizing system), 10% excreted.

Effect of alcohol in the body: Heart [Sedates muscle, Slows rate]. Lungs [Exhaled in small amounts, Smell on breath].

Brain [Depresses and sedates brain]. Order brain affected: [Inhibitory nerves, Judgement/reasoning, Speech/vision, Voluntary muscle control, Respiration/heart activity].

Hangovers [Dehydration: Antidiuretic hormone depressed, Increased urine output, Brain cells dehydrate, Rehydration → severe headache]. Cure for Hangover [TIME, Fluids for rehydration].[10]

Figure 11: Alcohol euphoria in fantasy world.

Alcoholic hepatitis: Inflammation of the liver: Scar tissue, Reversible with Abstinence, Good nutrition.
Other problems related to alcohol abuse: Drinking in the workplace, Operating motor vehicles and equipment. Sexually transmitted diseases. Unplanned pregnancy. Children of alcoholics.

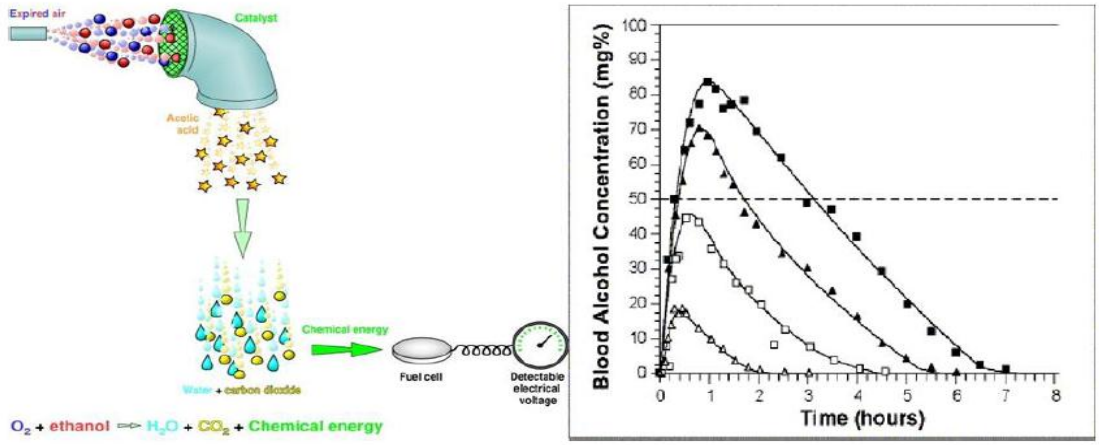


Figure 12: BAC pharmacokinetics.

Alcohol and Students: >1400 die from unintentional injuries, >600,000 assaults by drinking students, >70,000 victims of sexual assault/date rape, 400,000 unprotected sex, 100,000 too drunk to remember, Academic problems (25% of students), Vandalism (11% participate), Police involvement (5% contact with police/campus security), 110,000 arrests.
Fetal alcohol syndrome: Leading preventable birth defect, 3.3 per 10,000 births, Mental retardation, Poor growth, Physical deformities.
Brain damage: Subtle cognitive dysfunction and motor nerve deficit, Shrinks the brain, reduce oxygen and nutrients to the brain, Alcohol is a powerful depressant.

Alcohol dependency: Genetic links, Risk is increased fourfold in children of alcoholics, can be addictive and dangerous for some, warn these children by the age of 10, Low threshold may be genetic requires greater amounts of alcohol to produce same effects, Ethnic.
Depression: Goes with alcohol abuse, Alcohol only alleviates depression in the short run, No longer concerned about their health/behavior.
Diagnosis: Physiological dependence on alcohol, Tolerance to the effects of alcohol, Evidence of alcohol-associated illnesses (memory loss, liver disease, etc.), Continued drinking in defiance of medical and social

contradictions, Depression and blackouts, Flushed face/reddened skin.

Alcoholism: 4 symptoms: Craving, Loss of control, Physical dependence, Tolerance [~7% of Americans meet criteria

>50% of adults have alcoholic family member – active or recovering].

Treatment: Guidance from a physician, Counseling, Total abstinence, AA 12 step program, Treatment program.

Alcohol poisoning: Warning Signs [Semiconsciousness or unconsciousness, Slow respiration (8 or fewer per minute or lapse of greater than 8 seconds), Cold, clammy, pale, or even bluish skin, Strong odor of alcohol, Medication (blocks craving or cause physical reaction when drinking)].[11]

Figure 13: BAC Detection.

Testing: A sample of the ambient air is tested as a blank check. This is followed by a check sample of an air/ethanol standard. This checks the calibration of the device. The concentration of alcohol in the standard sample is 35µg/100 ml air, which is the UK drink–driving limit. Two samples of breath are then taken from the motorist and tested, each separated by a sample of air. The test ends with a final air and standard check. If the results from the two actual samples differ by 15% or more of the lower reading or 5µg, whichever is the greater, the device records an error message. The driver is then asked to provide a sample of blood or urine for laboratory analysis. If the lower of the two results lies between 40µg and 50µg/100 ml breath, the driver has the right to ask for a blood sample. If the lower result is greater than 50µg/100 ml breath, the driver is prosecuted. Devices used for evidential breath testing use either a fuel cell (as with the screening devices) or an infrared cell. An infrared cell directs infrared energy through the sample and any unabsorbed energy at the other side is detected. The higher the concentration of ethanol, the more infrared absorption occurs (in much the same way that a sunglass lens absorbs visible light, alcohol absorbs infrared light). Accuracy depends on the sample of breath being deep lung air (alveolar air). As the driver breathes out, the device continuously monitors the expired air using an infrared cell. The concentration of ethanol climbs as expiration continues, and when the level of ethanol stabilizes, the sample of breath is analyzed. This ensures accurate alcohol readings and means that the volume of air each person has to blow will depend on how large his or her lungs are. Alcohol in the mouth gives a rapid peak in ethanol concentration on the evidential test. If the infrared cell that monitors the breath alcohol profile detects such a peak the test is aborted and a blood sample is required instead. These devices sometimes register ―interfering substances.[12]

If this happens the test is aborted and a blood sample is required. The maximum level of alcohol that may be accurately detected by evidential breath testers is 220 µg/100 ml air. The whole process takes 10 to 15 minutes with the fuel cell-based instrument, and up to 5 minutes with the purely infrared based ones. Five breath screening devices are currently approved for police use in Britain. They work on the principle that in the presence of a catalyst, oxygen in a sample of expired air converts any alcohol present into acetic acid and then to water and carbon dioxide. A fuel cell converts the chemical energy released when oxidation occurs into a detectable electrical voltage. The higher the voltage, the more alcohol is present in the sample.

CONCLUSION

Drivers are initially tested for alcohol impairment at the roadside with a screening device. If this produces a positive test, evidential breath testing is performed at the police station. Motorists can be stopped and required to take a breath test by police at the scene of a road traffic accident, if a police officer suspects a motorist may be driving under the influence of alcohol, or if a motorist commits a moving traffic offence. Screening devices are about the size of old-fashioned mobile phones. The driver blows into a disposable mouthpiece for each test. The whole process takes about a minute for the device to record the result. Screening devices offer four result

categories: zero (0.001–0.029%/volume, 0.030–0.059%/volume), pass (0.060–0.099%/volume, 0.100–0.199%/volume), warn (0.200–0.299%/volume, 0.300–0.399%/volume) and fail (0.400–0.500%/volume, >0.50%/volume). Anyone who fails the test is arrested and is required to perform an evidential breath test at a police station. The maximum permissible limit of alcohol in 100ml blood is 0.035%. The blood alcohol content (BAC) legal limit is 0.03% or 30µL alcohol in 100ml blood. Breathalyzers detect alcohol in blood through alcohol detection tests. The legal reading in 30 and above for drunk driving. This means per deciliter of blood, 30µL and above.

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