Blood alcohol content

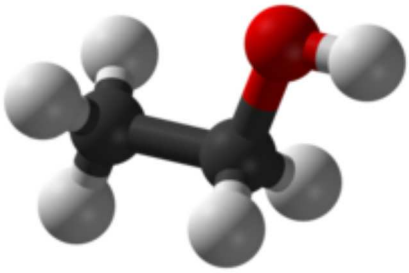
From Wikipedia, the free encyclopedia

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 content is usually expressed as a percentage of alcohol (generally in the sense of ethanol) in the blood. For instance, a BAC of 0.10 means that 0.10% (one tenth of one percent or one permille) of a person's blood, by volume (usually, but in some countries by mass), is alcohol.

Blood alcohol content

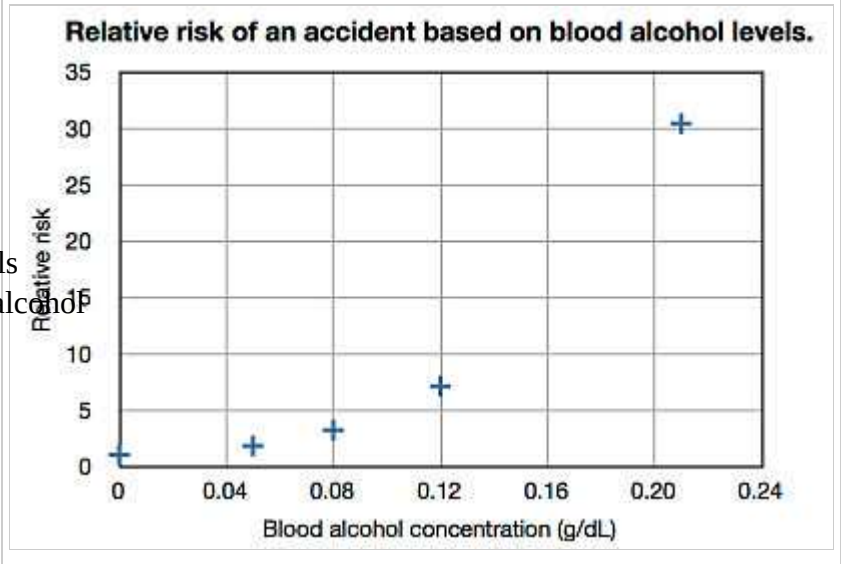
Diagnostics



Ethanol

LOINC 5639-0 (http://search.loinc.org/search.zul?query=5639-0), 5640-8 (http://search.loinc.org/search.zul?query=5640-8), 15120-9 (http://search.loinc.org/search.zul?query=15120-9), 56478-1 (http://search.loinc.org/search.zul?query=56478-1)

Contents



Blood Alcohol Level Chart

See also: Short-term effects of alcohol and Alcohol equivalence

Progressive effects of alcohol[1]		
BAC (% by vol.)	**Behavior**	**Impairment**
0.010–0.029	■ 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
0.06–0.09	■ Blunted feelings ■ Disinhibition ■ Extroversion	■ Reasoning ■ Depth perception ■ Peripheral vision ■ Glare recovery
0.10–0.19	■ Over-expression ■ Emotional swings ■ Anger or sadness ■ Boisterousness ■ Decreased libido	■ Reflexes ■ Reaction time ■ Gross motor control ■ Staggering ■ Slurred speech ■ Temporary erectile dysfunction ■ Possibility of temporary alcohol poisoning
0.20–0.29	■ Stupor ■ Loss of understanding ■ Impaired sensations ■ Possibility of falling unconscious	■ Severe motor impairment ■ Loss of consciousness ■ Memory blackout
0.30–0.39	■ Severe central nervous system depression ■ Unconsciousness ■ Possibility of death	■ Bladder function ■ Breathing ■ Dysequilibrium ■ Heart rate
0.40–0.50	■ General lack of behavior ■ Unconsciousness ■ Possibility of death	■ Breathing ■ Heart rate ■ Positional Alcohol Nystagmus
>0.50	■ High risk of poisoning ■ Possibility of death	

Standard drink chart (U.S.)[2]					
Alcohol	**Amount (ml)**	**Amount (fl oz)**	**Serving size**	**Alcohol (% by vol.)**	**Alcohol**
80 proof liquor	44	1.5	One shot	40	0.6 US fl oz (18 ml)
Table wine	148	5	One glass	12	0.6 US fl oz (18 ml)
Beer	355	12	One can/bottle	5	0.6 US fl oz (18 ml)

Male **Female**	**Approximate blood alcohol percentage (by vol.)**[3] **One drink has 0.5 US fl oz (15 ml) alcohol by volume**								
Drinks	**Body weight**								
	40 kg	**45 kg**	**55 kg**	**64 kg**	**73 kg**	**82 kg**	**91 kg**	**100 kg**	**109 kg**
	90 lb	**100 lb**	**120 lb**	**140 lb**	**160 lb**	**180 lb**	**200 lb**	**220 lb**	**240 lb**
1	– 0.05	0.04 0.05	0.03 0.04	0.03 0.03	0.02 0.03	0.02 0.03	0.02 0.02	0.02 0.02	0.02 0.02
2	– 0.10	0.08 0.09	0.06 0.08	0.05 0.07	0.05 0.06	0.04 0.05	0.04 0.05	0.03 0.04	0.03 0.04
3	– 0.15	0.11 0.14	0.09 0.11	0.08 0.10	0.07 0.09	0.06 0.08	0.06 0.07	0.05 0.06	0.05 0.06
4	– 0.20	0.15 0.18	0.12 0.15	0.11 0.13	0.09 0.11	0.08 0.10	0.08 0.09	0.07 0.08	0.06 0.08
5	– 0.25	0.19 0.23	0.16 0.19	0.13 0.16	0.12 0.14	0.11 0.13	0.09 0.11	0.09 0.10	0.08 0.09
6	– 0.30	0.23 0.27	0.19 0.23	0.16 0.19	0.14 0.17	0.13 0.15	0.11 0.14	0.10 0.12	0.09 0.11
7	– 0.35	0.26 0.32	0.22 0.27	0.19 0.23	0.16 0.20	0.15 0.18	0.13 0.16	0.12 0.14	0.11 0.13
8	– 0.40	0.30 0.36	0.25 0.30	0.21 0.26	0.19 0.23	0.17 0.20	0.15 0.18	0.14 0.17	0.13 0.15
9	– 0.45	0.34 0.41	0.28 0.34	0.24 0.29	0.21 0.26	0.19 0.23	0.17 0.20	0.15 0.19	0.14 0.17
10	– 0.51	0.38 0.45	0.31 0.38	0.27 0.32	0.23 0.28	0.21 0.25	0.19 0.23	0.17 0.21	0.16 0.19
Subtract approximately 0.01 every 40 minutes after drinking.									

Estimated blood ethanol concentration (EBAC)

To calculate estimated peak blood alcohol concentration (EBAC), a variation, including drinking period in hours, of the Widmark formula was used. The formula is:[4]

$$EBAC = \frac{0.806 \cdot SD \cdot 1.2}{BW \cdot Wt} - (MR \cdot DP)$$

where 0.806 is a constant for body water in the blood (mean 80.6%), SD is the number of standard drinks containing 10 grams of ethanol, 1.2 is a factor to convert the amount in grams to Swedish standards set by

The Swedish National Institute of Public Health, BW is a body water constant (0.58 for men and 0.49 for women), Wt is body weight (kilogram), MR is the metabolism constant (0.017), DP is the drinking period in hours and 10 converts the result to permillage of alcohol.[4] Regarding metabolism (MR) in the formula; Females demonstrated a higher average rate of elimination (mean, 0.017; range, 0.014-0.021 g/210 L) than males (mean, 0.015; range, 0.013-0.017 g/210 L). 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%).[5] 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 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. A study conducted at the University of Surrey in the United Kingdom gave subjects equal amounts of flat and sparkling Champagne which contained the same levels of alcohol. After 5 minutes following consumption, the group that had the sparkling wine had 54 milligrams of alcohol in their blood while the group that had the same sparkling wine, only flat, had 39 milligrams.[6]

Examples:

- 80 kg male drinking 3 standard drinks in two hours:

$$EBAC = (0.806 \cdot 3 \cdot 1.2)/(0.58 \cdot 80) - (0.015 \cdot 2) = 0.032534483 \approx 0.033 g/dL$$

- 70 kg woman drinking 2.5 standard drinks in two hours:

$$EBAC = (0.806 \cdot 2.5 \cdot 1.2)/(0.49 \cdot 70) - (0.017 \cdot 2) = 0.036495627 \approx 0.037 g/dL$$

Binge drinking

See also: Binge drinking

In most jurisdictions a measurement such as a blood alcohol content (BAC) in excess of a specific threshold level, such as 0.05% or 0.08% defines the offense. Also, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) define the term "binge drinking" as any time one reaches a peak BAC of 0.08% or higher as opposed to some (arguably) arbitrary number of drinks in an evening.[7]

Pleasure zone

Known as *pleasure zone*, the positive effects exceed the negative at concentrations typically between **0.030–0.059%** blood ethanol concentration (BEC), but the contrary becomes true at higher volumes (0.08% as defined by NIAAA); especially concentrations typical of binge drinking.[*citation needed*]

Units of measurement

There are several different units in use around the world for defining blood alcohol concentration. Each is defined as either a mass of alcohol per volume of blood or a mass of alcohol per mass of blood (never a volume per volume). 1 milliliter of blood is approximately equivalent to 1.06 grams of blood. Because of this, units by volume are similar but not identical to units by mass. In the U.S. the concentration unit 1% w/v (percent mass/volume, equivalent to 10g/l or 1 g per 100 ml) is in use.[8] This is not to be confused with the amount of alcohol measured on the breath, as with a breathalyzer. The amount of alcohol measured on the breath is generally accepted as proportional to the amount of alcohol present in the blood at a rate of 1:2100.

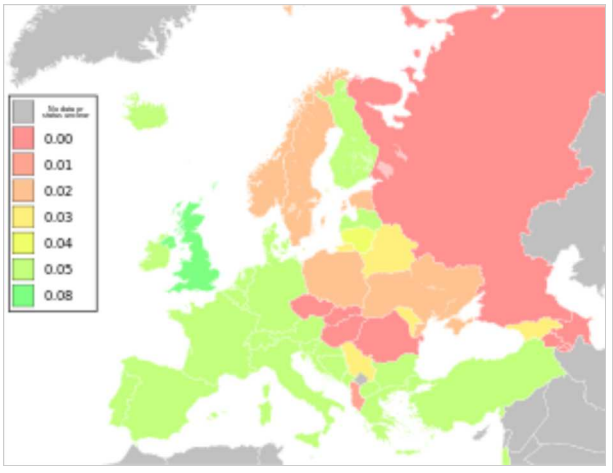
Therefore, a breathalyzer measurement of 0.10 mg/L of breath alcohol converts to 0.021 g/210L of breath alcohol, or 0.021 g/dL of blood alcohol (the units of the BAC in the United States). While a variety of units (or sometimes lack thereof) is used throughout the world, many countries use the g/L unit, which do not create confusion as percentages do. Usual units are highlighted in the table below.

Reference	Unit	Dimensions	Equivalent to	Used in
BAC by volume	**1 percent (%)**	1/100 g/mL = 1 g/dL	9.43 mg/g, 217.4 mmol/L	United States, Australia, Canada
	1 permille (‰)	1/1000 g/mL = **1 g/L**	0.943 mg/g, 21.7 mmol/L	Austria, Bulgaria, France, Latvia, Lithuania, Netherlands, Poland, Romania, Spain, Switzerland, Turkey
	1 basis point (‱)	1/10,000 g/mL = **10 mg/100 mL**	94.3 ppm, 2.17 mmol/L	Great Britain
BAC by mass	1 percent (%)	1/100 g/g = 1 cg/g	1.06 cg/mL, 230 mmol/L	
	1 permille (‰)	1/1000 g/g = 1 mg/g	1.06 mg/mL, 23 mmol/L	Finland, Norway, Sweden, Denmark, Germany, Russian Federation
	1 part per million (ppm)	1/1,000,000 g/g = 1 µg/g	1.06 µg/mL, 23 µmol/L	

Legal limits

Further information: Drunk driving law by country

For purposes of law enforcement, blood alcohol content is used to define intoxication and provides a rough measure of impairment. Although the degree of impairment may vary among individuals with the same blood alcohol content, it can be measured objectively and is therefore legally useful and difficult to contest in court. Most countries disallow operation of motor vehicles and heavy machinery above prescribed levels of blood alcohol content. Operation of boats and aircraft are also regulated.



Map of Europe showing countries' blood alcohol limits as defined in g/dl for the general population.

The alcohol level at which a person is considered legally impaired varies by country. The list below gives limits by country. These are typically blood alcohol content limits for the operation of a vehicle.

Zero effective tolerance

It is illegal to have any measurable alcohol in the blood while driving in these countries. Most jurisdictions have a tolerance slightly higher than zero to account for false positives and naturally occurring alcohol in the body. Some of the following jurisdictions have a general prohibition of alcohol.

- Australia- Learner drivers or those drivers with a Provisional/Probationary Licence
- Bangladesh
- Brazil

- Brunei
- Canada—new drivers undergoing graduated licensing in Ontario or British Columbia,[9] drivers under the age of 22 in Alberta, Manitoba, New Brunswick, Northwest Territories, Nova Scotia, Ontario,[10] Saskatchewan and Quebec.[11]
- Croatia—professional drivers, driving instructors and drivers of the vehicle categories C1, C1+E, C, C+E, D, D+E and H; the limit for other drivers is 0.50 mg/g, but they do get an additional separate fine if they cause an accident while having a blood alcohol level between 0 and 0,50 mg/g [12]
- Czech Republic
- Estonia
- Fiji
- Hungary
- Israel 24 mg per 100 ml (0.024%) of breath (penalties only apply above 26 mg per 100 ml (0.026%) of breath due to lawsuits about sensitivity of devices used). New drivers, drivers under 24 years of age and commercial drivers 5 mg per 100 ml of breath.(0,005%) [13]
- New Zealand—drivers under the age of 20
- Nepal
- Oman
- Pakistan
- Paraguay
- Romania (beyond 0.08% drivers will not only receive a fine and have their license suspended, the offense will also be added to their criminal records.)
- Russia (0‰ permille introduced in 2010,[14] cancelled in September 2013[15])
- Saudi Arabia
- Slovakia
- United Arab Emirates
- United States—drivers under the age of 21

0.02%

- China
- Israel 24 mg per 100 ml (0.024%) of breath (penalties only apply above 26 mg per 100 ml (0.026%) of breath due to lawsuits about sensitivity of devices used). New drivers, drivers under 24 years of age and commercial drivers 5 mg per 100 ml of breath.(0,005%) [13]
- Netherlands (for drivers in their first five years after gaining a driving license)[16]
- Norway (road vehicles and sea vessels over 15 m)[17]
- Poland
- Puerto Rico [18]
- Sweden
- Ukraine

0.03%

- Belarus
- Chile
- India (note: In the state of Kerala, a policy of zero tolerance has developed.)[19]
- Serbia
- Japan[20]
- Uruguay[21] (0.00% for truck/taxi/bus drivers)[22]
- Russia (since September 2013[15])

0.04%

- Lithuania (0.02% for drivers in their first two years after gaining a driving license)

0.05%

- Argentina (0.02% for motorbikes, 0.00% for truck/taxi/bus drivers)
- Australia (0.00% for Australian Capital Territory learner, provisional and convicted DUI drivers (changed down from 0.02% on December 1, 2010), 0.02% for truck/bus/taxi, 0.00% for learner drivers, provisional/probationary drivers (regardless of age), truck and bus drivers, driving instructors and DUI drivers in all other states)
- Austria - no limit for pedestrians; 0.08% for cycling; 0.05% generally for cars <7,5 t (driving licence B) and motorbikes (A); but 0,01% during learning (for driver and teacher or L17-assistant), during probation period (at least the first 2 years) or up to the age of 20 (A1, AM, L17, F), trucks (C >7,5 t), bus (D), drivers of taxi and public transport [23][24]
- Belgium
- Bosnia and Herzegovina
- Bulgaria
- Canada: Alberta, British Columbia, Ontario, Manitoba, Newfoundland, Nova Scotia, New Brunswick —provincial offence
- Costa Rica[25]
- Croatia—professional drivers, driving instructors and drivers of the vehicle categories C1, C1+E, C, C+E, D, D+E and H; the limit for other drivers is 0.50 mg/g, but they do get an additional separate fine if they cause an accident while having a blood alcohol level between 0 and 0,50 mg/g [12]
- Denmark
- Finland
- France (0.025% for bus drivers)[26]
- Germany (0.0‰ for learner drivers, all drivers 18–21 and newly licensed drivers of any age for first two years of licence; also, if the BAC exceeds 0.3‰, driving is illegal if the driver is showing changes in behavior ("*Relative Fahruntüchtigkeit*"))
- Greece
- Hong Kong
- Iceland
- Ireland (0.02% for learner drivers and professional drivers)[27]
- Italy (0.00% for drivers in their first three years after gaining a driving license)
- Latvia (0.02% for drivers in their first two years after gaining a driving license)
- Luxembourg
- Macedonia (0.00% for drivers in their first two years after gaining a driving license)
- Netherlands (0.02% for drivers in their first five years after gaining a driving license)[16]
- New Zealand (for drivers over 20, from 2014.)
- Peru
- Philippines[28]
- Portugal
- Slovenia (0.00% for drivers in their first two years after gaining a drivers licence, drivers under 21 and common drivers, such as buses, trucks...)
- South Africa
- Spain (0.03% for drivers in their first two years after gaining a driving license and common carriers, such as buses, trucks...)
- Switzerland (0.01% for drivers in their first three years after gaining a drivers licence and for driving instructors)[29]

- Thailand
- Taiwan (breath alcohol limit decreased from 0.25 to 0.15 from 13 June 2013)
- Turkey

0.06%

- The Bahamas[30]

0.08%

- Canada[31]—criminal offence
- England and Wales[32] (0.02% for operators of fixed-wing aircraft; both countries share the same law regarding motoring alcohol limits.)
- Malaysia
- Malta
- Mexico
- New Zealand (0.00% for drivers under 20) [33]
- Norway (legal limit for sea vessels under 15 m)[34]
- Northern Ireland (The government of Northern Ireland intends to reduce the general limit to 0.05%.[35])
- Puerto Rico (for drivers 21 years and older)[18]
- Scotland (The Scottish Government intends to reduce the limit to 0.05%.[36])
- Singapore[37]
- United States—all states impose penalties for driving with a BAC of 0.08% or greater [38] (down from 0.15% just a few decades previously.[39]). Even below those levels drivers can have civil liability and other criminal guilt (e.g., in Arizona driving impairment to any degree caused by alcohol consumption can be a civil or criminal offense in addition to other offenses at higher blood alcohol content levels). Drivers under 21 (the most common U.S. legal drinking age) are held to stricter standards under zero tolerance laws adopted in varying forms in all states: commonly 0.01% to 0.05%. See Alcohol laws of the United States by state. Federal Motor Carrier Safety Administration: 0.04% for drivers of a commercial vehicle requiring a commercial driver's license[40] and 0.01% for operators of common carriers, such as buses.[41]

0.1%

- Cayman Islands
- Legally drunk in some jurisdictions

Limits by country (BrAC: Breath Alcohol Content)

In certain countries, alcohol limits are determined by the Breath Alcohol Content (BrAC), not to be confused with blood alcohol content (BAC).

- In Greece, the BrAC limit is 250 microgrammes of alcohol per litre of breath. The limit in blood is 0.50 g/l. The BrAC limit for drivers in their first two years after gaining a driving license and common carriers is 100 microgrammes per litre of breath.
  - BrAC 250–400 = €200 fine.
  - BrAC 400–600 = €700 fine, plus suspension of driving license for 90 days (introduced in 2007)[42]
  - BrAC >600 = 2 months imprisonment, plus suspension of driving license for 180 days, plus

€1,200 fine
- In Hong Kong, the BrAC limit is 220 microgrammes per litre of breath (as well as other defined limits)
- In The Netherlands and Finland, the BrAC limit is 220 microgrammes of alcohol per litre of breath (µg/l, colloquially known as "Ugl").
- In New Zealand, the BrAC limit is 400 micrograms of alcohol per litre of breath for those aged 20 years or over, and zero for those aged under 20 years.
- In Singapore, the BrAC limit is 350 microgrammes of alcohol per litre of breath.[37]
- In Spain the BrAC limit is 250 microgrammes of alcohol per litre of breath and 150 microgrammes per litre of breath for drivers in their first two years after gaining a driving license and common carriers.
- In the United Kingdom the BrAC limit is 350 microgrammes of alcohol per litre of breath (as well as the above defined blood alcohol content).

Other limitation schemes

- For South Korea, the penalties for different blood alcohol content levels include
  - 0.01–0.049 = No Penalty
  - 0.05–0.09 = 100 days license suspension
  - >0.10 = Cancellation of car license.

Scientific definitions

"0.01" Blood alcohol content is the hundredth decimal part of the one thousandth part of a liter. (Please note that this "0.01" is measured in permille and not percentage as the "0.1" example in introduction and numbers in 1 Effects at different levels.)

In digesting these numbers it must be remembered that one milliliter is the thousandth part of a liter. Therefore 1% of a milliliter is 0.00001-Liter. Expressing blood-alcohol concentration as "0.01" is naming the hundredth part of a thousandth part.

As final example, a blood-alcohol concentration of 0.08, being the 0.08 "part" of a milliliter (ITSELF the thousandth part of a Liter) therefore names an absolute blood-alcohol volume of 0.00008-Liter (within every liter of blood).

Each country or state may define BAC differently. For example, the state of California in the United States legally defines BAC as a ratio of grams of alcohol per 100 milliliters of blood,[43] which is equal to grams of alcohol per deciliter of blood.

Since measurement must be accurate and inexpensive, several measurement techniques are used as proxies to approximate the true parts per million measure. Some of the most common are listed here: (1) Mass of alcohol per volume of exhaled breath (for example, 0.38 mg/L; see also breath gas analysis), (2) Mass per volume of blood in the body (for example, 0.08 g/dL), and (3) Mass of alcohol per mass of the body (for example, 0.0013 g/Kg).

The number of alcoholic beverages (drinks) consumed is often a poor measure of blood alcohol content because of variations in sex, body weight, and body fat.

An ethanol level of 0.10% is equal to 22 mmol/l or 100 mg/dl of blood alcohol.[44][45] This same 0.10% BAC also equates to 0.10 g/dL of blood alcohol or 0.10 g/210L of exhaled breath alcohol or 0.476 mg/L of exhaled breath alcohol. Likewise, 0.10 mg/L of exhaled breath alcohol converts to 0.02% BAC, 0.022 g/dL of blood alcohol or 0.022 g/210L of exhaled breath alcohol.

Test assumptions

Blood alcohol tests assume the individual being tested is average in various ways. For example, on average the ratio of blood alcohol content to breath alcohol content (the *partition ratio*) is 2100 to 1. In other words, there are 2100 parts of alcohol in the blood for every part in the breath. However, the actual ratio in any given individual can vary from 1300:1 to 3100:1, or even more widely.[46][47] This ratio varies not only from person to person, but within one person from moment to moment. Thus a person with a true blood alcohol level of .08% but a partition ratio of 1700:1 at the time of testing would have a .10 reading on a Breathalyzer calibrated for the average 2100:1 ratio.

A similar assumption is made in urinalysis. When urine is analyzed for alcohol, the assumption is that there are 1.3 parts of alcohol in the urine for every 1 part in the blood, even though the actual ratio can vary greatly.

Breath alcohol testing further assumes that the test is *post-absorptive*—that is, that the absorption of alcohol in the subject's body is complete.[48] If the subject is still actively absorbing alcohol, their body has not reached a state of *equilibrium* where the concentration of alcohol is uniform throughout the body. Most forensic alcohol experts reject test results during this period as the amounts of alcohol in the breath will not accurately reflect a true concentration in the blood.

Auto-brewery syndrome is a rare medical condition where the stomach produces brewers yeast that breaks down starches into ethanol; which enters the blood stream. [49] [50]

Metabolism and excretion

Alcohol is absorbed throughout the gastrointestinal tract, but more slowly in the stomach than in the small or large intestine. For this reason, alcohol consumed with food is absorbed more slowly, because it spends a longer time in the stomach. Furthermore, alcohol dehydrogenase is present in the stomach lining. After absorption, the alcohol passes to the liver through the hepatic portal vein, where it undergoes a first pass of metabolism before entering the general bloodstream.[51]

Alcohol is removed from the bloodstream by a combination of metabolism, excretion, and evaporation. The relative proportion disposed of in each way varies from person to person, but typically about 95% is metabolized by the liver. The remainder of the alcohol is eliminated through excretion in breath, urine, sweat, feces, milk and saliva.[52] Excretion into urine typically begins after about 40 minutes, whereas metabolisation commences as soon as the alcohol is absorbed, and even before alcohol levels have risen in the brain.

Alcohol is metabolized mainly by the group of six enzymes collectively called alcohol dehydrogenase. These convert the ethanol into acetaldehyde (an intermediate that is actually more toxic than ethanol). The enzyme acetaldehyde dehydrogenase then converts the acetaldehyde into non-toxic Acetic acid.

Many physiologically active materials are removed from the bloodstream (whether by metabolism or excretion) at a rate proportional to the current concentration, so that they exhibit exponential decay with a characteristic halflife (see pharmacokinetics). This is not true for alcohol, however. Typical doses of alcohol actually saturate the enzymes' capacity, so that alcohol is removed from the bloodstream at an approximately constant rate. This rate varies considerably between individuals; Another sex based difference is in the elimination of alcohol. Persons below the age of 25[*citation needed*], women[53] persons of certain ethnicities, and persons with liver disease may process alcohol more slowly, also false positive of High (BAC) reading are related to patients with proteinuria and hematuria, due to kidney-liver metabolism and failure. (for example, Hematuria 1+ protenuria 1+) Also have impaired acetaldehyde dehydrogenase; this causes acetaldehyde levels to peak higher, producing more severe hangovers and other effects such as flushing and

tachycardia. Conversely, members of certain ethnicities that traditionally did not use alcoholic beverages have lower levels of alcohol dehydrogenases and thus "sober up" very slowly, but reach lower aldehyde concentrations and have milder hangovers. Rate of detoxification of alcohol can also be slowed by certain drugs which interfere with the action of alcohol dehydrogenases, notably aspirin, furfural (which may be found in fusel alcohol), fumes of certain solvents, many heavy metals, and some pyrazole compounds. Also suspected of having this effect are cimetidine (Tagamet), ranitidine (Zantac), and acetaminophen (Tylenol) (paracetamol).

Currently, the only known substance that can increase the rate of metabolism of alcohol is fructose. The effect can vary significantly from person to person, but a 100g dose of fructose has been shown to increase alcohol metabolism by an average of 80%. Fructose also increase false positive of High ratio (BAC) reading to Patients with proteinuria and hematuria, due to kidney-liver metabolism.[54]

Alcohol absorption can be slowed by ingesting alcohol on a full stomach. Spreading the total absorption of alcohol over a greater period of time decreases the maximum alcohol level, decreasing the hangover effect. Thus, drinking on a full stomach or drinking while ingesting drugs which slow the breakdown of ethanol into acetaldehyde will reduce the maximum blood levels of this substance and thus decrease the hangover. Alcohol in non-carbonated beverages is absorbed more slowly than alcohol in carbonated drinks.[55]

Retrograde extrapolation

Retrograde extrapolation is the mathematical process by which someone's blood alcohol concentration at the time of driving is estimated by projecting backwards from a later chemical test. This involves estimating the absorption and elimination of alcohol in the interim between driving and testing. The rate of elimination in the average person is commonly estimated at .015 to .020 grams per deciliter per hour (g/dl/h),[56] although again this can vary from person to person and in a given person from one moment to another. Metabolism can be affected by numerous factors, including such things as body temperature, the type of alcoholic beverage consumed, and the amount and type of food consumed.

In an increasing number of states, laws have been enacted to facilitate this speculative task: the blood alcohol content at the time of driving is legally presumed to be the same as when later tested. There are usually time limits put on this presumption, commonly two or three hours, and the defendant is permitted to offer evidence to rebut this presumption.

Forward extrapolation can also be attempted. If the amount of alcohol consumed is known, along with such variables as the weight and sex of the subject and period and rate of consumption, the blood alcohol level can be estimated by extrapolating forward. Although subject to the same infirmities as retrograde extrapolation—guessing based upon averages and unknown variables—this can be relevant in estimating BAC when driving and/or corroborating or contradicting the results of a later chemical test.

Cases of high blood alcohol levels

On Monday March 26, 2012, a man was found in a ditch in Indiana, USA with a BAC of 0.552%.[57]

In November 2007, a driver was found passed out in her car in Oregon in the United States. A blood test showed her blood alcohol level was 0.550%. She was charged with several offenses, including two counts of driving under the influence of an intoxicant, reckless endangerment of a person, criminal mischief and driving with a suspended license. Her bail was later set at US$50,000, since she had several previous convictions for similar offenses.[58][59][60]

In December 2007, a driver was arrested in Klamath County, Oregon, after she was found unconscious in her car which was stuck in a snow bank with its engine running. Police were forced to break a car window to

remove her. After realizing she was in an alcohol-induced coma, they rushed her to the hospital where a blood test showed her blood alcohol level was 0.720%. She reportedly was released from the hospital the next day.[58][61] She was subsequently charged with drunk driving.[62]

In July 2008, a driver was arrested after he ran into a highway message board on Interstate 95 in Providence, Rhode Island. A breath test showed his blood alcohol level was at 0.491% and he was raced to the hospital where he was sedated and placed in a detoxification unit. He was subsequently charged with driving while intoxicated and resisting arrest.[63][64] He was later sentenced to one year probation, a $500 fine, 40 hours of community service and a one-year loss of his driver's license. The police later stated that his blood alcohol level was the highest they had ever seen for someone who hadn't died of alcohol poisoning.[65] It was later estimated that the driver had consumed 10–14 drinks over the course of 1–2 hours,[58] based on the standard levels of elimination which as documented previously can vary by up to 300%.

In December 2009, a South Dakota woman was found behind the wheel of a stolen car with a measured blood alcohol content of .708%, almost nine times the state's limit of .08%, thus becoming the highest recorded level of alcohol toxicity for the state. After she was hospitalized, she was released on bond and subsequently found in another stolen automobile while under the influence.[66]

In August 2012, an Iowa man was arrested for driving under the influence. Breathalyzers and subsequent lab tests confirmed a BAC of .627%, about 8 times the legal limit for driving. At that blood alcohol level, he was conscious, yet incoherent and unable to answer simple questions.[67]

Highest recorded blood alcohol level/content

There have been reported cases of blood alcohol content higher than 1.00%. In March 2009, a 45-year-old man was admitted to the hospital in Skierniewice, Poland, after being struck by a car. The blood test showed blood alcohol content at 1.23. The man survived but did not remember either the accident or the circumstances of his alcohol consumption.[68] One such case was reported by O'Neil, and others in 1984. They report on a 30-year-old man who survived a blood alcohol concentration of 1,500 mg/100 ml blood after vigorous medical intervention.[69]

In South Africa, a man driving a Mercedes-Benz Vito light van containing 15 sheep, allegedly stolen from nearby farms, was arrested on December 22, 2010, near Queenstown in Eastern Cape. His blood had an alcohol content of 1.6 g/100 ml. Also in the vehicle were five boys and a woman who were also arrested.[70]

In 2004, an unidentified Taiwanese woman died of alcohol intoxication after immersion for twelve hours in a bathtub filled with 40% ethanol. Her blood alcohol content was 1.35%. It was believed that she had immersed herself as a response to the SARS epidemic.[71]

In Poland, a homeless man was found sleeping half-naked on January 28, 2011, in Cieszyn. His blood had an alcohol level of 1.024%. Despite the temperature of −10 °C and extremely high blood alcohol content the man survived.[72]

In December 2004, a man was admitted to the hospital in Plovdiv, Bulgaria, after being struck by a car. After detecting a strong alcohol odor, doctors at a hospital conducted a breath test which displayed the man's blood alcohol content at 0.914.[73] The man was treated for serious injuries sustained in the crash and survived.[74]

In February 2005, French gendarmes from Bourg-en-Bresse, France, conducted a breath test on a man who had lost control of his car. He had an alcohol content of 0.976.[75] He was not injured in the accident but was charged with a €150 fine and his driving license was canceled.

In 1982, a 24-year-old woman was admitted to the UCLA emergency room with a serum alcohol concentration of 1.5 (1,510 mg/dL), corresponding to a BAC of 1.33. She was alert and oriented to person and place.[76] Serum alcohol concentration is not equal to nor calculated in the same way as blood alcohol content.[77]

In 2012, on Oct 26th a man from Olszewo-Borki community, Poland, who died in a car accident, had 2.23%; however, the blood sample was collected from a wound and thus possibly contaminated.[78]

In 2013, on July 26th a 30-year-old man from Alfredówka, Poland, was found by Municipal Police Patrol from Nowa Dęba lying in the ditch along the road in Tarnowska Wola. At the hospital there was recorded that the man had 13.74 permille of alcohol in the blood (1.374%). The man survived.[79][80]

References

Notes

1. ^ A hybridizing of effects as described at *Alcohol's Effects (http://www.alcohol.vt.edu/Students/alcoholEffects /index.htm)* from Virginia Tech and Federal Aviation Regulation (CFR) 91.17: *Alcohol and Flying* (http://flightphysical.com/pilot/alcohol.htm) (hosted on *FlightPhysical.com*)
2. ^ Based on the CDC standard of 0.6 fl oz alcohol per drink. CDC alcohol FAQ (http://www.cdc.gov/alcohol /faqs.htm)
3. ^ BAC Charts (http://www.alcohol.vt.edu/Students/alcoholEffects/estimatingBAC/index.htm) from Virginia Tech
4. ^ ***a b*** Andersson, Agneta; Wiréhn, Ann-Britt; Ölvander, Christina; Ekman, Diana; Bendtsen, Preben (2009). "Alcohol use among university students in Sweden measured by an electronic screening instrument" (//www.ncbi.nlm.nih.gov/pmc/articles/PMC2724514). *BMC Public Health* **9**: 229. doi:10.1186/1471-2458-9-229 (http://dx.doi.org/10.1186%2F1471-2458-9-229). PMC 2724514 (//www.ncbi.nlm.nih.gov/pmc/articles /PMC2724514). PMID 19594906 (//www.ncbi.nlm.nih.gov/pubmed/19594906).
5. ^ Cowan Jr, JM; Weathermon, A; McCutcheon, JR; Oliver, RD (1996). "Determination of volume of distribution for ethanol in male and female subjects" (http://jat.oxfordjournals.org/cgi/pmidlookup?view=long& pmid=8872236). *Journal of analytical toxicology* **20** (5): 287–90. doi:10.1093/jat/20.5.287 (inactive February 5, 2013). PMID 8872236 (//www.ncbi.nlm.nih.gov/pubmed/8872236).
6. ^ G. Harding *"A Wine Miscellany"* pg 136–137, Clarkson Potter Publishing, New York 2005 ISBN 0-307-34635-8
7. ^ "Quick Stats: Binge Drinking." The Centers for Disease Control and Prevention. April 2008.[1] (http://www.cdc.gov/alcohol/quickstats/binge_drinking.htm).
8. ^ Research & Articles on Blood Alcohol Concentration by | BookRags.com (http://www.bookrags.com/research /blood-alcohol-concentration-dat-01/)
9. ^ Impaired Driving - The Various Suspensions and Prohibitions (http://www.pssg.gov.bc.ca/osmv/prohibitions /impaired-driving.htm)
10. ^ Keeping Drivers Safe (http://www.news.ontario.ca/mto/en/2010/07/keeping-drivers-safe.html)
11. ^ Tolérance zéro pour les conducteurs de moins de 21 ans | Patrice Bergeron | National (http://www.cyberpresse.ca/actualites/quebec-canada/national/201202/17/01-4497213-tolerance-zero-pour-les-conducteurs-de-moins-de-21-ans.php)
12. ^ ***a b*** Driving law (hr) (http://narodne-novine.nn.hr/clanci/sluzbeni/339713.html)
13. ^ ***a b*** "Alcohol and Driving" (http://he.mot.gov.il/index.php?option=com_content&view=article& id=1836:alcohol-nehiga&catid=113:nehigat-horef-c&Itemid=164). Ministry of Transport. Retrieved 2 July 2012.
14. ^ "Medvedev signs total drink driving ban" (http://en.rian.ru/russia/20100723/159918024.html). RIAN. 2010-07-23.
15. ^ ***a b*** "Russian drivers to be allowed to have slight alcohol content in blood" (http://www.itar-tass.com/en/c39 /786163.html). Itar-tass. 2013-07-26.
16. ^ ***a b*** Alcohol | Onderwerp | Rijksoverheid.nl (http://www.alcohollimiet.nl/)
17. ^ /d: LOV-1965-06-18-4 :d/ Lov om vegtrafikk (vegtrafikkloven) (http://www.lovdata.no/all/tl-19650618-004-004.html#22)
18. ^ ***a b*** [2] (http://www.driveandstayalive.com/articles%20and%20topics/drunk%20driving/artcl--drunk-driving-0005--global-BAC-limits.htm)

19. ^ according to Section 185 of Motor Vehicles Act 1988 (http://morth.nic.in/writereaddata/sublinkimages/chap13f9342852843.pdf). On first offence, the punishment is imprisonment of 6 months and/or fine of 2000 Indian Rupees (INR). If the second offence is committed within three years, the punishment is 2 years and/or fine of 3000 Indian Rupees (INR). The clause of 30 mg/dL was added by an amendment in 1994. It came into effect beginning 14 November 1994.
20. ^ http://www.npa.go.jp/annai/license_renewal/english.pdf The breath alcohol concentration limit for driving in Japan is 0.15 mg/l, which, assuming a breath alcohol to blood alcohol ratio of 1:2,100, is roughly equivalent to a BAC of 0.0315%. The penalties become even more severe at 0.25 mg/l, which is roughly equivalent to a BAC of 0.0525%.
21. ^ http://www.presidencia.gub.uy/unasev/news/2009/2009030401.htm Desde el 16 de marzo, la concentración de alcohol en sangre permitida será de 0,3 gr/l
22. ^ http://www.presidencia.gub.uy/_web/leyes/2007/11/TO393_19%2010%202007_00001.PDF Ley 18.191, art. 47
23. ^ https://www.help.gv.at/Portal.Node/hlpd/public/content/4/Seite.042000.html Alkohol am Steuer, HELP.gv.at, of 19. January 2013, retr. 22. April 2013
24. ^ http://www.verkehrspsychologie.at/gesetzliche_grundlagen_fuehrerscheinentzug.htm Gesetzliche Grundlagen für den Führerscheinentzug (Alkohol), verkehrspsychologie.at, AAP - Angewandte Psychologie und Forschung GmbH, Wien, retr. 22. April 2013
25. ^ Carros de ebrios 'saturan' los planteles del MOPT (in Spanish). http://www.nacion.com/ln_ee/2009/enero/01/pais1826383.html La Nacion]
26. ^ Between 0.05% and 0.08%, drivers can be fined €135 and have six points removed from their licence. Above 0.08%, the punishment is more severe with possible imprisonment of up to two years, heavy fines and licence suspension. http://www2.securiteroutiere.gouv.fr/ressources/conseils/l-alcool-au-volant.html (in French)
27. ^ [3] (http://www.rte.ie/news/2010/0624/drink.html)
28. ^ Blood Alcohol Concentration (BAC) Limits Worldwide (http://www.icap.org/Table/BACLimitsWorldwide)
29. ^ http://www.tcs.ch/fr/voyages-camping/infos-touristiques/news/nouveautes.php
30. ^ Driving Under the Influence Unit (http://royalbahamaspolice.org/traffic/duiu.php)
31. ^ Criminal Code of Canada (http://laws.justice.gc.ca/en/ShowDoc/cs/C-46/bo-ga:l_VIII::bo-ga:l_IX//en?page=6&isPrinting=false#codese:253)
32. ^ Directgov (http://www.direct.gov.uk/en/TravelAndTransport/Roadsafetyadvice/DG_195019)
33. ^ [4] (http://www.nzta.govt.nz/resources/roadcode/about-limits/alcohol-and-drugs-limits.html) Alcohol and drugs limits
34. ^ /d: LOV-1998-06-26-47 :d/ Lov om fritids- og småbåter (http://www.lovdata.no/all/tl-19980626-047-005.html#33)
35. ^ DOE - Biggest shake up in drink driving laws for forty years - Attwood (http://www.doeni.gov.uk/news_Details.htm?newsRef=1679)
36. ^ - Consultation launched on reducing Scotland's drink-drive limit (http://www.bbc.co.uk/news/uk-scotland-19490952)
37. ^ ***a*** ***b*** Driving In Singapore - Home (http://driving-in-singapore.spf.gov.sg/services/Driving_in_Singapore/Information/pressandmsg/drinkdriving.htm)
38. ^ National Institute of Alcohol Abuse and Alcoholism. http://alcoholpolicy.niaaa.nih.gov/Blood_Alcohol_Concentration_Limits_Adult_Operators_of_Noncommercial_Motor_Vehicles.html. Accessed on February 01, 2013.
39. ^ [5] (http://www.local-dui-attorney.org)[U.S. BAC Levels]
40. ^ Commercial Driver's License Program (CDL/CDLIS) - Federal Motor Carrier Safety Administration (http://www.fmcsa.dot.gov/registration-licensing/cdl/cdl.htm)
41. ^ FindLaw for Legal Professionals - Case Law, Federal and State Resources, Forms, and Code (http://caselaw.lp.findlaw.com/casecode/uscodes/18/parts/i/chapters/17a/sections/section_343.html)
42. ^ http://www.sefeaa.gr/downloads/2009/KOK.pdf
43. ^ California's legal definition of BAC (http://dmv.ca.gov/pubs/vctop/d11/vc23152.htm)
44. ^ Wilson, E; Waring, W S (2007). "Severe hypotension and hypothermia caused by acute ethanol toxicity" (//www.ncbi.nlm.nih.gov/pmc/articles/PMC2658221). *Emergency Medicine Journal* **24** (2): e7. doi:10.1136/emj.2006.041590 (http://dx.doi.org/10.1136%2Femj.2006.041590). PMC 2658221 (//www.ncbi.nlm.nih.gov/pmc/articles/PMC2658221). PMID 17251602 (//www.ncbi.nlm.nih.gov/pubmed/17251602).
45. ^ "Blood Alcohol - Health & Wellness - Blue Shield of California, Health & Wellness - Blue Shield of California" (https://www.blueshieldca.com/hw/articles/hw_article.jsp?articleId=HWHW3564&fromCategoryId=6&_requestid=210377).
46. ^ http://www.denverdui.com/drunk_driving_defense/blood_partition_ratio.html
47. ^ http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1689868/

48. ^ http://www.duiblog.com/2005/03/22/breathalyzer-inaccuracy-testing-during-the-absorptive-state/
49. ^ http://www.dailymail.co.uk/news/article-2425253/Auto-brewery-syndrome-makes-bacteria-brew-beer-mans-stomach.html. Missing or empty `|title=` (help)
50. ^ Barbara Cordell; Justin McCarthy (July 2013). "A Case Study of Gut Fermentation Syndrome (Auto-Brewery) withSaccharomyces cerevisiae as the Causative Organism" (http://www.scirp.org/journal/PaperInformation.aspx?PaperID=33912). *International Journal of Clinical Medicine* **4**: 309–312.
51. ^ Alan J.Buglass, ed. (2011). *Handbook of alcoholic beverages : technical, analytical and nutritional aspects* (http://books.google.co.za/books?id=gNc34oNpg0AC&pg=PT219). Chichester: Wiley. ISBN 9780470976654. Retrieved 6 July 2013.
52. ^ Alcohol and the Human Body (http://www.intox.com/t-Physiology.aspx)
53. ^ Thomasson, Holly R. (2002). "Gender Differences in Alcohol Metabolism". *Recent Developments in Alcoholism*. Recent Developments in Alcoholism **12**. pp. 163–72. doi:10.1007/0-306-47138-8_9 (http://dx.doi.org/10.1007%2F0-306-47138-8_9). ISBN 0-306-44921-8.
54. ^ Mascord, D; Smith, J; Starmer, GA; Whitfield, JB (1991). "The effect of fructose on alcohol metabolism and on the lactate/pyruvate ratio in man" (http://alcalc.oxfordjournals.org/cgi/pmidlookup?view=long&pmid=1854373). *Alcohol and alcoholism* **26** (1): 53–9. PMID 1854373 (//www.ncbi.nlm.nih.gov/pubmed/1854373).
55. ^ Roberts, C.; Robinson, S.P. (2007). "Alcohol concentration and carbonation of drinks: The effect on blood alcohol levels". *Journal of Forensic and Legal Medicine* **14** (7): 398–405. doi:10.1016/j.jflm.2006.12.010 (http://dx.doi.org/10.1016%2Fj.jflm.2006.12.010). PMID 17720590 (//www.ncbi.nlm.nih.gov/pubmed/17720590).
56. ^ Montgomery, Mark R.; Reasor, Mark J. (1992). "Retrograde extrapolation of blood alcohol data: An applied approach". *Journal of Toxicology and Environmental Health* **36** (4): 281–92. doi:10.1080/15287399209531639 (http://dx.doi.org/10.1080%2F15287399209531639). PMID 1507264 (//www.ncbi.nlm.nih.gov/pubmed/1507264).
57. ^ Report: Center Township man's alcohol level nearly 7 times legal limit : Valparaiso News (http://www.nwitimes.com/news/local/porter/valparaiso/report-center-township-man-s-alcohol-level-nearly-times-legal/article_4d702a27-4720-5eb7-93d6-4d42a91c3ad9.html)
58. ^ ***a b c*** Extreme Drunk Driving (http://abcnews.go.com/Health/story?id=5436334&page=1) by Russell Goldman, ABC News, July 24, 2008.
59. ^ DUI Suspect's 'Lethal Dose' Earns $50K Bail (http://abcnews.go.com/US/story?id=4061172) by David Schoetz, ABC News, December 28, 2007.
60. ^ Deputies: Woman Had 0.55% Blood Alcohol Level (http://www.kptv.com/news/14935069/detail.html), KPTV News, December 27, 2007.
61. ^ Drunkest Driver Ever? (http://www.thesmokinggun.com/archive/years/2008/0110084dui1.html), The Smoking Gun, January 10, 2008.
62. ^ Oregon Woman's Blood Alcohol Level Nine Times Legal Limit (http://www.foxnews.com/story/0,2933,321747,00.html), Associated Press (reprinted by Fox News), January 10, 2008.
63. ^ R.I. Police Arrest Man With Record .491 Blood Alcohol Level (http://www.foxnews.com/story/0,2933,389223,00.html), Associated Press (reprinted by Fox News), July 23, 2008.
64. ^ DUI suspect had highest alcohol level recorded (http://www.projo.com/ri/northprovidence/content/dui_bac_07-23-08_BLAV3UB_v22.411a2ee.html) By Richard C. Dujardin, *The Providence Journal*, July 23, 2008.
65. ^ Police: Driver's Blood Alcohol Level Highest Registered for Someone Not Dead (http://www.foxnews.com/story/0,2933,433803,00.html), Fox News, October 07, 2008.
66. ^ [6] (http://rapidcityjournal.com/news/article_9d4a1d0e-f4d1-11de-8edf-001cc4c002e0.html), *Rapid City Journal*, December 29, 2009
67. ^ http://thegazette.com/2012/08/13/twice-lethal-dose-of-alcohol-recorded-in-north-liberty-arrest/
68. ^ Jones, AW (1999). "The Drunkest Drinking Driver in Sweden: Blood Alcohol Concentration 0.545% w/v" (http://www.jsad.com/jsad/link/60/400). *Journal of Studies on Alcohol and Drugs* **60** (3): 400–6. PMID 10371269 (//www.ncbi.nlm.nih.gov/pubmed/10371269).
69. ^ O'Neill, Shane; Tipton, KF; Prichard, JS; Quinlan, A (1984). "Survival After High Blood Alcohol Levels: Association with First-Order Elimination Kinetics". *Archives of Internal Medicine* **144** (3): 641–2. doi:10.1001/archinte.1984.00350150255052 (http://dx.doi.org/10.1001%2Farchinte.1984.00350150255052). PMID 6703836 (//www.ncbi.nlm.nih.gov/pubmed/6703836).
70. ^ Drunkest driver in SA arrested (http://www.sowetanlive.co.za/news/2010/12/24/drunkest-driver-in-sa-arrested) *Sowetan*
71. ^ Wu, Yen-Liang; Guo, How-Ran; Lin, Hung-Jung (2005). "Fatal alcohol immersion during the SARS epidemic in Taiwan". *Forensic Science International* **149** (2–3): 287. doi:10.1016/j.forsciint.2004.06.014 (http://dx.doi.org/10.1016%2Fj.forsciint.2004.06.014). PMID 15749375 (//www.ncbi.nlm.nih.gov/pubmed/15749375).

72. ^ [7] (http://wiadomosci.wp.pl/kat,1515,title,Mial-1024-promila-alkoholu-we-krwi-i-przezyl,wid,13081966,wiadomosc.html) *Sowetan*
73. ^ Bulgarian's blood-alcohol level astounds doctors (http://www.cbc.ca/world/story/2005/01/04/drunk-bulgarian-050104.html), CBC News, January 4, 2005 (retrieved on March 16, 2009).
74. ^ Bulgarian Sets World Record for Highest Blood Alcohol Level (http://www.novinite.com/view_news.php?id=43228), Sofia News Agency (Novinte.com), January 4, 2005 (retrieved on March 31, 2009).
75. ^ Absolute record for a breath test (fr) (http://lci.tf1.fr/france/2005-02/volant-record-controle-absolu-4859363.html)
76. ^ Johnson, R (1982). "Survival After a Serum Ethanol Concentration of 11/2%". *The Lancet* **320** (8312): 1394. doi:10.1016/S0140-6736(82)91285-5 (http://dx.doi.org/10.1016%2FS0140-6736%2882%2991285-5).
77. ^ Labianca, Dominick A. (2002). "Conversion of Serum-Alcohol Concentrations to Corresponding Blood-Alcohol Concentrations". *Journal of Chemical Education* **79** (7): 803. Bibcode:2002JChEd..79..803L (http://adsabs.harvard.edu/abs/2002JChEd..79..803L). doi:10.1021/ed079p803 (http://dx.doi.org/10.1021%2Fed079p803).
78. ^ http://www.eostroleka.pl/smiertelny-rekord-kierowca-z-powiatu-ostroleckiego-mial-22-promile-alkoholu-zginal-w-wypadku-zdjecia,art31892.html
79. ^ http://wiadomosci.gazeta.pl/wiadomosci/1,114871,14402847,Mial_13_74_promila_alkoholu_we_krwi__I_przezyl__Rekord.html
80. ^ http://www.nowadeba.pl/mieszkaniec/bezpieczenstwo/straz-miejska/informacje/art,864,straznicy-miejscy-uratowali-zycie-mieszkanca-alfredowki-.html

Bibliography

- Carnegie Library of Pittsburgh. Science and Technology Department. *The Handy Science Answer Book*. Pittsburgh: The Carnegie Library, 1997. ISBN 978-0-7876-1013-5.
- Perham, Nick; Moore, Simon C.; Shepherd, Jonathan; Cusens, Bryany (2007). "Identifying drunkenness in the night-time economy". *Addiction* **102** (3): 377–80. doi:10.1111/j.1360-0443.2006.01699.x (http://dx.doi.org/10.1111%2Fj.1360-0443.2006.01699.x). PMID 17298644 (//www.ncbi.nlm.nih.gov/pubmed/17298644).
- Taylor, L., and S. Oberman. *Drunk Driving Defense*, 6th edition. New York: Aspen Law and Business, 2006. ISBN 978-0-7355-5429-0.

External links

- International Blood Alcohol Limits (http://www.driveandstayalive.com/articles%20and%20topics/drunk%20driving/artcl--drunk-driving-0005--global-BAC-limits.htm)
- Blood Alcohol levels with practical exercises (http://www.faslink.org/bal.htm)
- Comprehensive International BAC (Blood Alcohol Content) Limits (http://www.drinkdriving.org/worldwide_drink_driving_limits.php) Prescribed legal driving limits for over 250 jurisdictions