



Dräger Review ¹⁰⁷

special

Technology for Life

Risky Beauty: White
Zinfandel grape seen
through a microscope

Drugs and Alcohol
Effects, Dangers, Protection

60 billion euros

is the economic damage caused by drunk workers each year in the EU – more beginning on page 32.



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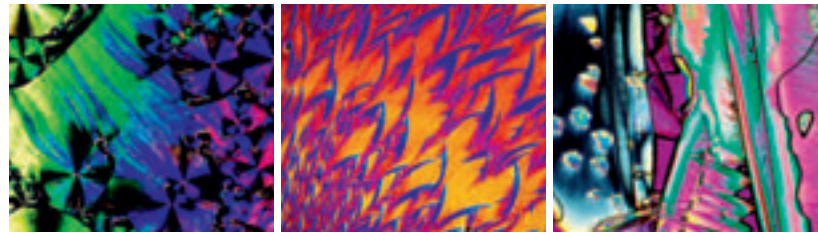
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Cover image: White Zinfandel, a type of grape, reveals its hidden beauty beneath the microscope. Michael W. Davidson of Florida State University in the USA has photographed different intoxicants using this technology since 1992, including (from left to right): Beer, Tequila Sunrise, and meth-cathinone, a psychoactive stimulant



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Global Drug Consumption

Some substances change the way you feel. This was discovered long ago, and ever since then people have been growing and producing these substances, initially as a doorway to the world of the gods, then as a product consumed for recreation. A glass of wine can do you good, a bottle can be hazardous – to both you and others. Here are some **MILESTONES** in the world of inebriation.

Atlanta, Georgia, USA: Coca-Cola (1887)

Physician and Druggist John Stith Pemberton developed 'Coca-Cola', which originally contained "Peruvian coca leaves, wine, and cola nuts".



Akron, Ohio, USA: Dry (1935)

On Mother's Day, William Griffith Wilson and Robert Holbrook Smith founded the self-help group Alcoholics Anonymous, which now has around two million members in more than 180 countries.

Kincardine O'Neil, Scotland: Ice Bock (2012)

The world's strongest beer has an alcohol content of 65 percent: 'Armageddon' by Brewmeister (type: 'ice bock').



Bethel, New York, USA: My Generation (1969)

Without drugs in front of, on, and behind the stage, the legendary and rainy Woodstock Festival would surely have been a washout.



Vienna, Austria: Drug Report (2012)

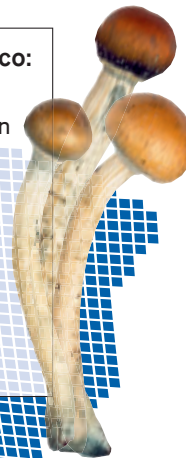
According to the 'World Drug Report' (www.unodc.org), 230 million people – around three percent of the world's population – have consumed illegal drugs in their lives. Heroin, cocaine, and others cause 200,000 drug-related deaths – annually.

Ouagadougou, Burkina Faso, West Africa: Humanization of the Ape (approx. 2000 BC)

The original inhabitants of the sub-Sahara grew millet and brewed beer from it. Legend has it that it was this which made them true humans – they lost their fur and tails.

Mixeteco Mountains, Mexico: Magic Mushrooms (1955)

American banker R. Gordon Wasson became the first outsider ever to partake in the ceremonial consumption of psychoactive mushrooms. His publication in *LIFE* triggered a boom in 1957.



South Pacific: Kava

Here, a euphoriant drink is made from kava (Piper methysticum).



Lima, Peru: Souvenir (1859)

The Austrian expedition ship „Novara“ stashes a 60-pound bale of coca leaves. A year later Albert Niemann isolated 'cocaine' from this stash in Göttingen, Germany.

Tierra del Fuego and Patagonia: Minimalism

Plants that can be fermented do not grow here, which is why people have been unable to manufacture alcoholic beverages.

Darmstadt, Germany: Party Drug (1912)

The pharmaceutical company Merck synthesized MDMA, which later became famous as 'ecstasy'.



Novaya Zemlya, Russia: Half a Spirit (1924)

To the shamans, every fly agaric mushroom embodies a mushroom spirit. They eat two and a half of them so that the half-mushroom-spirit keeps turning around to look for its other half so the shaman can keep up with it.



Çatal Höyük, Turkey: Ancient Vintage (approx. 5500 BC)

In 1961 James Mellaart found a vessel in an excavation containing remnants of wine, the earliest evidence of the drink.



New Delhi, India: Betel

The leaves of this palm are part of the "betel bite". They have a euphoriant effect and are mentioned in early Sanskrit texts, making them one of the oldest known drugs.

Canton, China: First Opium War (1839–42)

The English smuggled opium from India into China. When the Manchus forbade this the Opium War ensued, and China lost. One of the consequences was the cession of Hong Kong.

Alamut, Iran: Hashish (approx. 1000 AD)

The secret society of the Assassins ('hashish smokers') threatened nearby rulers with assassination. What is not clear is whether the fighters received hashish as an incitement or a reward.

Saigon, Vietnam: Courier (1970)

A pilot working for the American Ambassador is arrested carrying heroin worth eight million U.S. dollars.

Vietnam: Apocalypse Now (1971)

In the "Golden Triangle" (Laos, Thailand, Myanmar) Heroin No. 4 is produced. American army doctors estimate that 10 to 15 percent of all American soldiers in Vietnam consume heroin.

Ethiopian Highlands, East Africa: Origin of Khat

An everyday drug in this region. The cathinone contained in the leaves of the khat bush is a psycho-stimulant.



Java, Indonesia: Monopoly (19th century)

The Netherlands generated as much as 15 percent of their income from their colony by selling opium.



Between Dream and Nightmare

People, with their eternal desire for transcendence, for the state of intoxication and liberation, desire from the limitations of existence itself, will let themselves instigate wars, change societies, and build business empires – **LEGAL AND ILLEGAL.**

It all started with plants defending themselves from herbivores. In the course of evolution, many plants developed chemical shields so as not to be eaten: ingredients which were either poisonous or distasteful to animals. In the depths of prehistory the first humans discovered that these plants were also poisonous to them. But they discovered something else too: many of these leaves, roots, mushrooms, and cacti, when administered in the right doses, produced astounding effects on the eater. They alleviated pain, healed illness, and facilitated contact with the spirits, gods, and ancestors. Therefore healers and shamans were needed because only they knew the fine line between trance and poisoning.

Intoxication Since Antiquity

Consciousness-altering plants have been part of human history since the very beginning. The Old Testament mentions hallucinatory acting mandragora (mandrake) as well as myrrh, a tropical resin which in high doses is analgesic rather like opium. For thousands of years people have made products from hemp and hashish to intoxicate themselves. Herodotus writes of the Scythians, a nation of horsemen who inhabited the steppes of Eastern Europe in the 8th and 7th centuries BC, and who, in their steam-baths, cast hemp seeds onto red-hot stones and became “so ecstatic that they cried out with joy.”

With the spread of Islam and its mandatory rules of life, social changes came to the Orient from the 8th cen-



What can be learned from nature, and how can nature be reconstituted for the benefit of mankind? Even alchemists of old sought to answer this



Beautiful but terrible: the opium poppy is the source of the drug

PHOTOS: AKG-IMAGES (2), THINKSTOCK

Road to cigarettes: the USA in 1916, child labor for the harvesting and processing of tobacco leaves



ture AD onwards. Outlawing alcohol made drugs like opium, hashish, locoweed, and khat more significant. The exotic stories of Scheherazade in the 1001 Nights seem to originate in a colorful plume of hashish smoke. Yet hashish was more of a poor-man's herb in old Islamic societies; the more affluent reached for opium. Hashish has also been known since the Neolithic Age in China and India. In India its use was subject to strict rituals – as it still is to a degree today in the cult surrounding the Vedic god of fertility, Shiva.

In the modern era, following a dark period of witchcraft and witch-hunts involving hallucinogenic drugs like henbane and belladonna, a phase of geographical and intellectual expansion occurred which had a direct impact on the use of drugs. Christopher Columbus discovered America in 1492. The tobacco plants arrived back in Europe with the Spanish Conquistadors, and explorers and traders carried tobacco from there all over the world. Used at first as a healing and medicinal plant in courtly circles and by medics as well as biologists on account of its stimulating effect, at the end of the 16th Century people began to smoke its leaves following the Indian model. This new fashion spread quickly, and the authorities – and clergy – were soon trying to work out ways to forbid the new custom. Having had little success in their many attempts to restrict the consumption of tobacco, rulers decided at least to earn something from it. So tobacco was taxed – even today: tax revenues

amounting to more than fourteen billion euros (2011 in Germany alone) “significantly contribute to maintain the social and medical problems associated”, Dr. Henrik Jungaberle, Addiction Prevention and Drug Researcher at the University of Heidelberg.

Genie from the Bottle

The cultural history of tobacco, still used today by some people of the Amazon as a healing and religious plant, represents an example of how many plant-derived psychoactive substances have undergone a change of meaning over the course of time, evolving from ritually consumed sacraments, into a largely individualized means of enjoyment.

This is easy to follow using opium as an example, just as we can trace a line from the plant itself to the isolated, intoxicating substance. The physician and naturalist Paracelsus (1493–1541) used laudanum (which means ‘praiseworthy’), a tincture of opium containing alcohol, to make opium into an everyday medicine for the treatment of common complaints in broad sections of society, rather like aspirin today. For 400 years it was probably the most widely used medicament in the Western world, which may also be why it was the first drug to be analyzed scientifically.

In 1804 the pharmacist F. W. Sertürner succeeded in isolating the ‘sleep-inducing substance’ in opium, known as morphine. This was the first time that the active ingredient in a plant-based product had been separated from the inactive. As early on >

Every ban on drugs and alcohol releases enormous criminal energies

> as 1827 the Darmstadt-based company Merck began to mass-produce morphine. The invention of the hollow needle for injections came in 1841, paving the way, from a medical point of view, for the military hospitals to treat the wounded in the Franco-German War of 1870/71. Morphine became the ‘medicine of the soldiers’. Countless combatants returned home addicted.

In order to retain the pain-relieving effect while excluding the risk of addiction, ‘heroin’, named in remembrance of the wounded war-heroes, was produced in 1898 using morphine and acetic acid, and mass-marketed. Heroin remains one of the most dangerous addictive drugs up to this day. According to the European Union Annual Report 2012, an average of one person has died

every hour from an overdose of opioids over the past ten years in the EU. Most of these deaths involved heroin.

War on Drugs

Modern chemistry and the onset of the Industrial Revolution were the motivational forces behind another fundamental transformation: ritually used trance inducers became, with the isolation of the individual substances in them, pharmacological consumer goods used according to one’s state of mind: either to lift up, or to forget. Albert Niemann succeeded in 1860 in isolating cocaine from the coca plant. From there it did not take long to arrive at the ‘Roaring Twenties’ when bohemian society and the *demimonde* in Berlin and Paris plunged into the hysterical nighttime consumption of ‘snow’.

Over the course of the 20th century there were a growing number of international treaties aimed at restricting the worldwide production of morphine and cocaine. The International Opium Convention of 1912 aimed for the first time to monitor global production of the two drugs. Substances which until then had been widespread and used among other things as medicines were declared illegal. Several other treaties followed, until in 1961 the Single Convention on Narcotic Drugs bound more than 180 nations under international law, and subjected poppy, coca, and cannabis plants – as well as substances produced from them, and certain derivatives – to strict controls, while prohibiting all non-medical uses.



White gold: a drug dealer in Columbia prepares cocaine for sale on the streets



Little effort, great return: Farmers mix baking soda under the coca leaves, which can sweat the cocaine out better under the sun

However, the classification into legal and illegal drugs is controversial. As in the previous prohibition efforts (Alcohol: United States, 1919-1933; Opium: China, 19th century) enormous economic and criminal energies were released to circumvent the bans. Much money can be made from the smuggling of drugs, as the British East-India Company found out in India and China in the 19th century. By smuggling opium into sealed-off China, that trading entity attempted to offset British foreign trade deficits originating with China in the tea trade. China, which could not defend itself against this flood of drugs was forced to open up its markets and to tolerate the opium trade.

To this day, many people earn a lot of money with illegal drug production and trafficking. The policy of global drug prohibition, launched by former American President Richard Nixon as the ‘War on Drugs’, has failed. This was admitted by the Global Commission on Drug Policy in its 2011 report. Drug cartels are a component of globally organized criminality alongside money laundering, trade in weapons, and human trafficking. And it is more successful than ever before.

Hare and Tortoise

The wheel of drugs turns ever faster. Every week a new drug is brought on the market in the EU, says the EU drug observation agency in their 2011 annual report. There is a hare-and-tortoise game in play, the stakes being mainly ‘legal drugs’ – psychoactive designer



Ceremony: Hindus in Rajasthan in Northern India prepare themselves for a virtual journey. Everything is done for the ride on their “opium-vehicle”

substances sold as finished products. They contain synthetic cannabinoids and cathinones (derivatives of cannabis and khat substances). They manage to circumvent the Narcotics Act because they are not explicitly forbidden. As soon as they are incorporated after a delay into the Narcotics Act, and thereby forbidden, new variant forms arise to which the Act does not yet apply. Among these substances found in “bath salts” (see page 23) are amphetamine-like substances such as mephedrone and bupropion, but also the cathinones in herbal blends like Spice and K2. Cecilia Malmström, Member of the EU Commission, says: “Stimulants and synthetic drugs play a central role in the European drug situ-

ation, because they give rise to a market which is fast-changing, volatile, and difficult to monitor.”

To this can be added the long-known stimulants and hallucinogens: ecstasy, LSD, GHB (date-rape-drugs), crack cocaine, crystal meth, desomorphine (‘krokodil’) – a hydra which grows two new heads for every one cut off. That is why more and more drug experts are realizing that the situation cannot be confronted by penal means alone. Besides education about effects and active involvement with the groups most at risk of drug abuse endangerment; many groups now see a way out of the misery and crime in a relaxation of the strict prohibitions – for drugs such as cannabis.

Regina Naumann



Working in the vineyard, Strasbourg, France (1519): from the grape to the barrel – wine-making was made by hand the entire way

From Biblical Vine to Gin Lane

Since prehistoric times people have crafted drinks containing the potable alcohol, **ETHANOL**. As a result of that there have always been interactions between the social, economic, and technological developments.

Neolithic Chinese menus may have included a cocktail of wine, mead, and rice beer. The people who settled on the banks of the Yellow River around 7000 BC fermented the juices of grapes and hawthorn berries together with honey and rice. This brew, which contained ten percent alcohol, is currently the oldest known man-made alcoholic beverage.

The Neolithic Chinese cocktail was reconstructed by American Molecular Archaeologist Patrick McGovern. He examined traces left behind in ceramic drinking vessels found during excavations in Jiahu, a Stone Age site in the Chinese province of Henan. By a complex process of proofs he decrypted the composition of this prehistoric drink: ‘Uncorking The Past’, as he calls it, which is also the title of his book.

Refining Raw Materials

In order to prepare for the fermentation process, people used to break down the starches in grains by chewing them. The amylase in their saliva converted long-chain polysaccharides into short-chain sugars – a rather uncouth procedure by today’s standards perhaps, yet very important in the history of alcoholic beverages. It was not the consumption of ethanol which was an issue 9000 years ago, but the very art of its production. Alcohol as a naturally occurring intoxicant is older than the history of modern man. Many animals enjoy the intoxicating effects of over-ripe fermented fruit whose sugar has been transformed by wild yeasts.

The art of producing alcoholic beverages coincided with the development of agriculture during the Neolithic Revolution. In particular the early civilizations improved the methods of agriculture, fruit growing and viticulture steadily, more feed stock was available for producing alcoholic beverages. Wine-growers and brewers refined the selection of raw materials, fermenting processes, and subsequent procedures such as distillation and storage. The alcoholic fermentation was probably discovered by accident and through observation. Beer's ancestor was a fermented cereal brew, while fermenting fruits produced wine-like drinks, allowing the physiological and psychological effects of alcohol to be enjoyed at any time.

One of the roots of beer production lies in Mesopotamia, where by the second millennium BC a wide range of beers had been established. In much of Central Europe, beer was one of the most important food-stuffs all the way up to the 17th century. Cultural scientist Wolfgang Schivelbusch even claims that the corpulent bodies depicted in northern European art in the 17th century had much to do with the cuisine of the day, which contained a lot of beer and beer soups. The Bavarian State regulations of 1516 which allowed only water, malt, yeast, and hops as raw materials for the production of beer was conceived at that time. This provision is known as the "Purity Law". (see Dräger Review 106; pages 18–21). The production of wine from grapes developed rapidly into a complex cultur-

al phenomenon. The British wine expert Oz Clarke writes that, in the third millennium before Christ the viticulture in Egypt had expanded so far, that experts made similar differences in the qualities, as it is the case today. The imagery of wine in biblical texts not least testifies to the early importance of viticulture.

Alcohol in the Tank

In order to obtain more concentrated alcoholic beverages, ethanol has to be distilled from the initial product. This was made possible around the year 1000 by means of what was known as the 'alembic', a vessel used to separate substances and it is according to this principle modern stills produce their high-quality spirits. Aside from mashes made from grains and fruits, more recent times have seen the introduction of potatoes (vodka) and sugar-cane (rum).

The alembic was the first in a series of technical innovations concerning alcoholic drinks. They included the bottle-fermentation of champagne (17th century), wine corks (18th century), refrigeration machines for the brewing of beer (19th century), and the continuous distillation of spirits (also 19th century). In 1889, Johann Heinrich Dräger contributed to this line of devel-

opment with his Lubeca valve which allowed beer to be tapped safely from a high-pressure carbon dioxide system.

The industrialization of the manufacture, storage, and distribution of alcoholic beverages has brought with it consistent quality and low prices. Cheap spirits (made from potatoes) have however been blamed for the kind of alcoholism depicted in the famous print 'Gin Lane'. This term describes the abuse of alcohol, in particular by lower groups of the population, during the Industrial Revolution.

Nowadays ethanol made on an industrial scale, from agricultural products, is becoming an increasingly important source of energy, used in products such as the vehicle fuels E10 (ten percent ethanol) and E85 (85 percent ethanol). The second-generation of biofuels will then no longer be derived from the same sources as drinking alcohol, but mainly from cellulose fibers. **Peter Thomas**



Solid Residues: American Molecular Archaeologist Patrick McGovern discovered substances in Stone Age ceramic flagons in China, and used them to reconstruct the making of alcoholic beverages



Read up:
Uncorking the Past – The Quest for Wine, Beer, and Other Alcoholic Beverages / University of California Press, 348 pages

Wings of the Spirit

Is mankind even conceivable without drugs? Almost always accompany him at all times and in every country **SUBSTANCES** that alter his thinking, feeling and acting.

As teenagers in Los Angeles come home from a night of popping ecstasy, a new day begins in China with drinks containing caffeine. Millions of cups of coffee, tea, and cola, as well as cigarettes and amphetamine pills, accompany people through their everyday lives all over the world. In West Africa men discuss the day's events amid clouds of hashish smoke, and in Europe millions of bottles of beer are opened at the end of each working day.

Few cultures get by without the intoxicating, mind-altering, or stimulating experiences of drugs: "Like food, drinks, and sex, intoxication is one of the fundamental needs of the human being," Wolfgang Nešković, a former German Federal High Court Judge, said that while campaigning for the liberal treatment of cannabis (see pages 66-67). "A human phenomenon is also to ritualize the consumption of intoxicating beverages and tobacco, to give it

a visible role and thus to communicate one's identity and social status," knows Dr. Henrik Jungaberle, Addiction Prevention and Drug Researcher at the University of Heidelberg.

Rituals Give Structure to Drug Consumption

Highly ritualized, religious forms of drug use are to be found primarily in Central and South America, South Asia, and Oceania. Plants containing psychoactive substances are given much importance by shamans and spiritual healers (see pages 6-9). Psilocybin mushrooms, peyote cactus, and locoweed are just some wings of the spirit and which the Indians of Central and South America have long used to penetrate the kingdom of the gods, spirits, and ancestors in their spiritual séances.

Many drugs are part of everyday life, such as the drinking of kava in the cultures of the South Pacific and the chewing of coca leaves in countries like Bolivia.

Drinking kava is a ritual used to promote friendly relations, and coca leaves help the coqueros – or coca-chewers – through their day. This type of drug consumption is deeply rooted in such cultures.

Stimulating drugs such as coffee, tea, and tobacco – together with cannabis and khat leaves – are ritual accompaniments to socializing, relaxation, and hospitality. They play an important role in social interaction, especially in Islamic countries because of the widespread abstinence from alcohol there. But rituals can also change, especially in the industrialized nations. "In our pluralistic society new rituals are forever arising – rituals that protect and rituals that encourage people to consume. Often they are given publicity in the media," says Drug Researcher Jungaberle. As the sunsets on the beach it will be enjoyed with certain alcoholic drinks, or heavily ritualized techno parties in industrial temples with its own jargon, its own music and drug use. New rituals of fasting and

PHOTOS: CARLOS VILLALON/REDOUX/LAIF, CHINA/GETTY IMAGES/REUTERS, ULLSTEIN BILD-IMAGEBROKER.NET/ ULRICH DOERING, PICTURE ALLIANCE, SCOTT HOUSTON/SYGMA/CORBIS



New York City: for Lara, ecstasy is the substance of choice



Lake Eyasi, Tanzania, Africa: young men pass around the hashish pipe



Nuku'alofa, Tonga Islands: women prepare the euphoriant kava from roots

El Alto, Bolivia: an old man fortifies himself with the leaves of the coca bush – as his forefathers did



drug abstinence are also emerging, and not only in Christian circles.

Alcohol has spread triumphantly across the whole world over the past 9,000 years, and abstinent cultures have found it difficult to hold it off in the face of globalization. Any culture where alcohol manages to get a foothold, then finds it difficult to abolish it. Excessive bans

such as the American prohibition from 1919 to 1933 did not last, and in fact became a major factor in the development of organized drug-related crime.

From Forbidden to Permissive – Both Have their Justification

A prohibition of alcohol derived from the Koran is true in much of the Islamic world. The verses concerned do not actually use the word “haram” (forbidden) – a minority of Muslim clergy take the position that only an excess of wine is forbidden – but this interpretation has not prevailed with in the institution.

Because of genetic predispositions in East-Asians, Aborigines, and the indigenous people of America their tolerance for alcohol is worse than most Europeans. They commonly have only a small amount of the enzyme alcohol dehydrogenase, which is used to break down alcohol in the liver, and for this reason they feel the effects more quickly. That is also why

the conquerors of America and Oceania had an easy time of destroying indigenous cultures using fire-water.

As an ancient intoxicant and stimulant alcohol is in most cultures a central element of ceremonies with which large and small transitions are celebrated in life. These range from ‘happy hour’ at the end of the working day, up to the end of school with drinking among high school seniors. Among the mestizos in Peru, maize beer is a constant companion to a range of events such as baptism, a boy’s first haircut, and ear-piercing for girls. In other cultures, alcohol strengthens people in their daily work: in Normandy you might pop into the bar for a Calvados, while in Peru, alcohol is consumed before heavy physical work.

With one point all cultures are certainly in agreement: drinking alcohol alone at home is suspicious and therefore frowned upon. **Regina Naumann**



Linhuang, China: Bangbangcha tea is one of the most popular everyday drinks in Asia

Multiple decades of technical progress: The first Dräger Alcotest with test tube came onto the market in 1953. Today, fast, precise measuring units incorporating electrochemical sensors are state of the art



Blow, Who Should

Drinking and driving is dangerous. For decades there was no measuring process available to determine a driver's **LEVEL OF INTOXICATION** quickly and reliably. In 1953 Dräger broke new ground with its first 'Alcotest'. Today, breath-alcohol measurements are even admissible in court.

Blow, read, finish: When Dräger brought its Alcotest device onto the market in 1953, it was the first time that a single breath-test could be used to find out whether or not a driver was under the influence of alcohol. Through continuous research into breath alcohol measurement, the Lübeck based company has since then developed a range of other methods based on electronic sensor systems - up to court usable measurement results,

to prove an offense pursuant to Paragraph 24a of the German Road Traffic Act. "The Dräger Alcotest 7110 Evidential MK III is currently the only device with a design certification from the *Physikalisch-Technische Bundesanstalt*," says Dr. Jürgen Sohège, Product Manager at Dräger.

On the other hand there is the first Alcotest with Dräger tubes (and a plastic bag to check volume), which still serves primarily as a pretest in road traf-

fic control to see whether somebody is intoxicated. The tubes contain sulfuric acid and yellow potassium dichromate. These basic substances react to form acetaldehyde and trivalent green chromium, during testing, when the ethyl alcohol known as ethanol passes through the tube together with the exhaled air. The intensity and extent of the coloration indicates the concentration of ethanol. If this pretest indicates a minor offense, or even a criminal



PHOTOS: DRÄGERWERK AG & CO. KGAA

nal act (an absolute inability to drive), then further analysis is performed for confirmation.

The development of the tube is a classic example of farsighted knowledge transference from another application. The know-how comes from the gas detection systems in which Dräger has set global standards since the 1930s, says the doctorate in electrochemistry Sohège. Dräger's engineers came up with the idea for the new measuring process the morning after a company party. The measurement process was timely, because of the mass motorization after the Second World War, the number of traffic accidents caused by alcohol increased dramatically. This is reflected in the case law. Thus, also in 1953 for the Federal Republic of Germany, a blood alcohol concentration of 1.5 per mille was

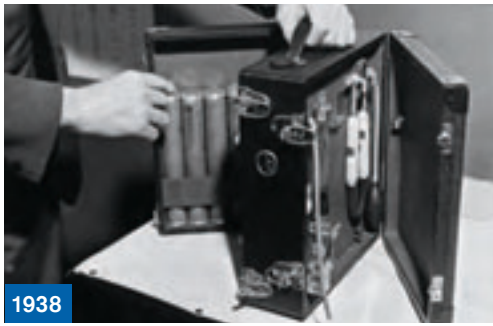
defined as the limit for absolute inability to drive. Similar limits were established elsewhere. The problem of driving under the influence of alcohol is a global one – as is the market for Dräger's Alcotest. In many countries the name is synonymous with alcohol testing.

From Intoxication and Steam Engines

The phenomenon of alcohol offenders on the roads was however not new in mid-20th Century, nor did it originate at the onset of automotive traffic. The automobile was not even invented when the British Parliament first made it an offense to drive under the influence of alcohol. In 1872 a Licensing Act was passed by Westminster in the hope of reducing the danger to the public caused by drunken vehicle drivers. The

motor-wagon was invented by Daimler and Benz in 1886, but the first such vehicle to reach England's shores did not arrive until 1894. In spite of this, however, the traffic in industrialized Britain was already heavy enough in 1870 to elicit a ban on being "drunk while in charge of any carriage, horse, cattle, or steam engine on any highway or other public place." Yet the Licensing Act of 1872 was not much of a success. The problem has accompanied the history of mobility ever since, and is countered all over the world by means of prohibitions, monitoring, and prevention.

But what exactly constitutes 'drunk'? Until the middle of the 20th Century, the authorities lacked a quick and reliable method of determining a driver's level of intoxication at road-side control points. It is difficult to measure exactly >



1938

The American 'Drunkometer' worked using a wet-chemical measuring process



1953

The classic: Dräger's Alcotest tubes



1953

Borkenstein (left) and his 'Breathalyzer'



1978

The 'Alcytron' prototype: the first to feature an infrared sensor

Since the 1920s and 1930s, the relationship between blood and breath alcohol content has been proven

> how much somebody's reactions are limited by the effect of alcohol, so instead the blood alcohol content (BAC) or the amount of alcohol in the urine is measured. These time-consuming procedures, however, are not really possible to perform on a large scale in everyday traffic monitoring.

"Then in the 1920s and 1930s it was scientifically proven that blood alcohol content could be determined by means of the breath," explains Dr. Sohège. The American doctor Emil Bogen suggested using exhaled breath to prove BAC as far back as 1927. Decisive in this respect were the studies done by Swedish pharmacologists Göran Liljestrand and Paul Linde, which they published in 1930 *On the Expulsion of Alcohol in Exhaled Air*. Liljestrand and Linde demonstrated

the link between exhaled air and blood alcohol concentration. They also assumed that the reason for this lay exclusively in the exchange of gas between the air and the blood in the lungs. Later however, the diffusion of alcohol in the entire respiratory track was recognized as the basis of the link between BAC and breath alcohol content (BrAC).

Dräger Tubes Offer the First Quick Test

The Swedish scientists concluded that "two liters of exhaled air (at 34 degrees Celsius) contain around as much alcohol as one cubic centimeter of blood." In most countries a factor of 2,100 is used as an average ratio between the measured values of blood and breath alcohol concentration (Blood Breath Ratio, BBR). Because the statistical spread of BBR is related to a range of peripheral conditions and extends from 2,000 to 2,300, it is not normal practice to convert one measured value directly into the other unit in tests that are to be used as evidence in court. Instead, independent limits have established themselves for both breath and blood alcohol tests, each with its own validity. In Germany's Road Traffic Act, Paragraph 24a states: "It is an offense to drive a motor vehicle on the road with 0.25 mg/l or more alcohol in the exhaled breath, or 0.5 per mille or more alcohol in the blood, or a quantity of alcohol in the body which leads to the aforementioned breath or blood alcohol concentrations." BAC is denoted in most countries in terms of milligrams of ethanol per kilogram of blood or per

liter of blood ('per mille'), while BrAC is given in milligrams of ethanol per liter of exhaled air.

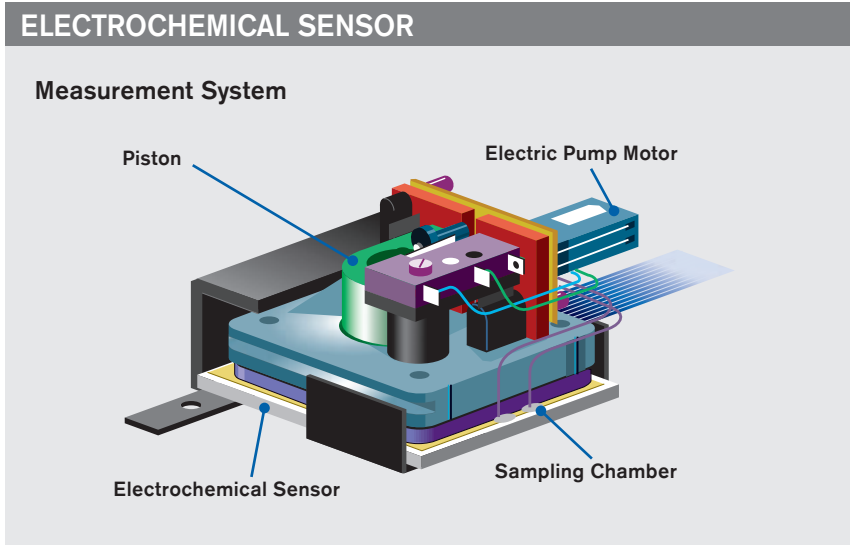
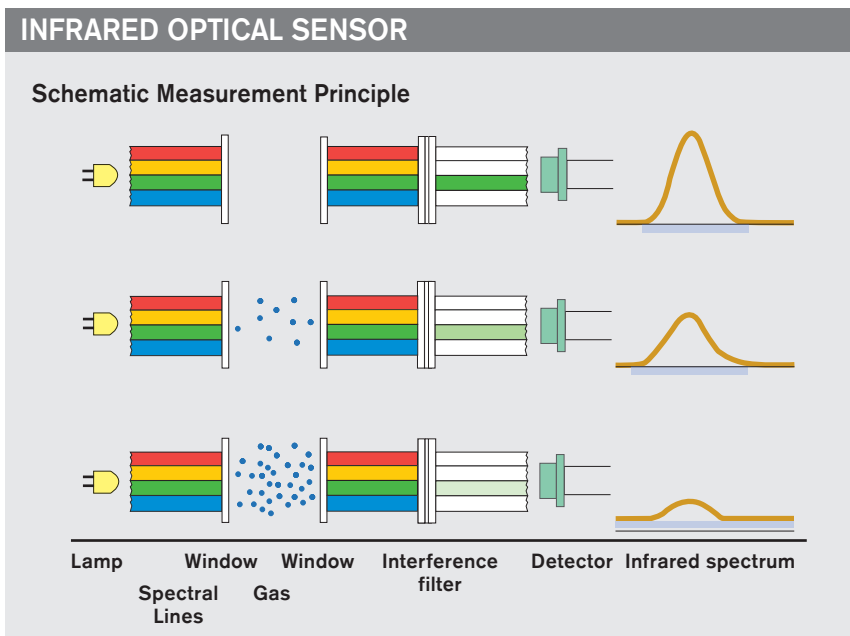
The first ever attempt to utilize the discovery of the link between BAC and BrAC to monitor road-users was the 'Drunkometer' which was developed in the USA in 1938 by Rolla N. Harger and which works on the basis of a wet-chemical process. "It was more of a transportable chemistry lab than a truly mobile test device," says Dr. Sohège. When Dräger launched its Alcotest tube onto the market in 1953, it was followed in North America by the 'Breathalyzer' developed by Robert F. Borkenstein, which measured the BrAC using a chemical reaction which was evaluated electrically. Dräger later took over the manufacture and distribution of the Breathalyzer.

But the Dräger tubes are the first alcohol test, which was regularly used operationally on the road to get an objective assessment of the BrAC. "Since the 1950s police and road traffic authorities have known that measuring the influence of alcohol on the spot as quickly as possible is a necessary part of reliable prevention," says Dr. Sohège. The testing tubes spread quickly as a result. They were accepted not only by the legal authorities, but also because they were so easy to read and understand by the drivers who were being monitored. Early markets alongside Germany included the United Kingdom, Sweden, and Australia.

The experts knew that the demands for alcohol analysis would be continually rising. "There was soon a demand for faster, more accurate – and therefore judicial-



Dräger took over the production of the 'Breathalyzer' from Smith & Wesson



PHOTOS: DRÄGERWERK AG & CO., KGAA, CORBIS (1), INDIANA UNIVERSITY (1)

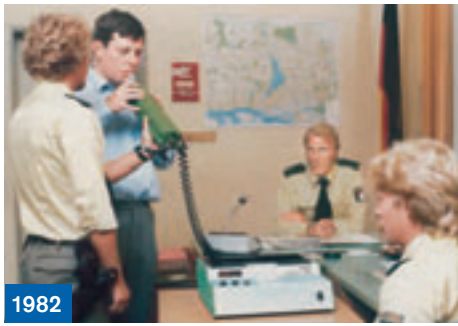
Infrared or electrochemical sensor: the two common measuring processes for determining breath alcohol concentration levels are based on different principles. While the infrared optical sensor measures the absorption of light by ethanol, the signal generated by an electrochemical sensor is produced by the oxidation of molecules on a catalytic layer

ly useful results,” says Dr. Sohège. He adds that from a criminological point of view, breath testing is the more direct of the two procedures, since the breath alcohol content which is related to the diffusion of alcohol from arterial blood provides a more direct reflection of the concentration of alcohol acting on the arteries in the brain than the blood alcohol level, which is measured in venous whole-blood, or its serum, using processes such as gas chromatography or alcohol dehydrogenase.

Measuring Equipment of the Future Will Be Based on Electronics

The new devices for testing breath alcohol which Dräger developed in the 1970s and 1980s utilize electrical and electronic systems. “When we developed this new technology we made good use of the possibilities offered by miniaturized sensors as each new generation of them came out,” says Dr. Sohège. Technical input came once again from the field of gas detection systems.

Already by 1978, Dräger was showing the way things were going to go with its ‘Alcytron’, a prototype incorporating an infrared optical sensor. In this process a light source emits infrared radiation of a specific wavelength, which is guided through a measuring chamber and then measured by a photocell. When the gas being measured is in the chamber, it absorbs part of the radiation, reducing the strength of the signal coming from the photocell. This allows you to deduce the concentration of gas. Four years later the Alcotest 7010 >



1982
Alcotest 7010 with an infrared optical sensor



1988
Electrochemical sensor: Alcotest 7410



1998
Measurements for use in court with the Alcotest 7110 Evidential



2003
Breath alcohol based immobilizer: Interlock XT

Modern electrical engineering is the key to breath alcohol measurements

> arrived on the market, but was only used for stationary purposes.

In parallel with its infrared technology, Dräger introduced a semiconductor sensor based on tin oxide. This measuring cell was used to equip the mobile Alcotest 7310 which came onto the market in 1980. From then on, measured values could be read on the digital display just seconds after a sample had been taken at a check-point. Soon, electrochemical sensors were setting new standards in fast and accurate BrAC monitoring. In these devices the measuring chamber is charged with a precisely defined volume of air. In the chamber, the ethanol contained in the air oxidizes electrochemically on the outside layer of a measuring electrode, which acts as a catalyzer, producing a current which

serves as a signal by which to produce a reading. This electrochemical sensor responds very specifically to alcohol, meaning that ketones, such as acetone, which may also be present in exhaled air cannot distort the result. The sensor was premiered in 1988 in the Alcotest 7410.

With its electrochemical sensor and infrared technology, Dräger had by 1990 established the two processes which would, over the coming years, lay the foundation for a series of innovations. The first Alcotest 7410 was used to develop a whole family of devices all the way to the 7410 Plus with its digital full-text display and electronic data transfer features. “The readings are generated in the local language of the country, this made measurements intuitively easy to follow for everyone involved,” explains Dr. Jürgen Sohège. Measuring devices incorporating electrochemical sensors have long since been standard issue for pretesting. In Germany today, virtually every police cruiser has an electronic alcohol measuring unit on board. The very latest Dräger pretest devices are the Alcotest 6510 introduced in 2004, the Alcotest 6810 (from the year 2005), and the Alcotest 7510 (2008).

But infrared technology is also progressing nicely: the Dräger Alcotest 7110 appeared in 1985 with an infrared sensor which responded especially selectively to alcohol. The third generation of this device (1994) can, as an option, be combined with an electrochemical sensor. This dual-sensor system became standard issue four years later in the Alcotest 7110 Evidential, forming the basis

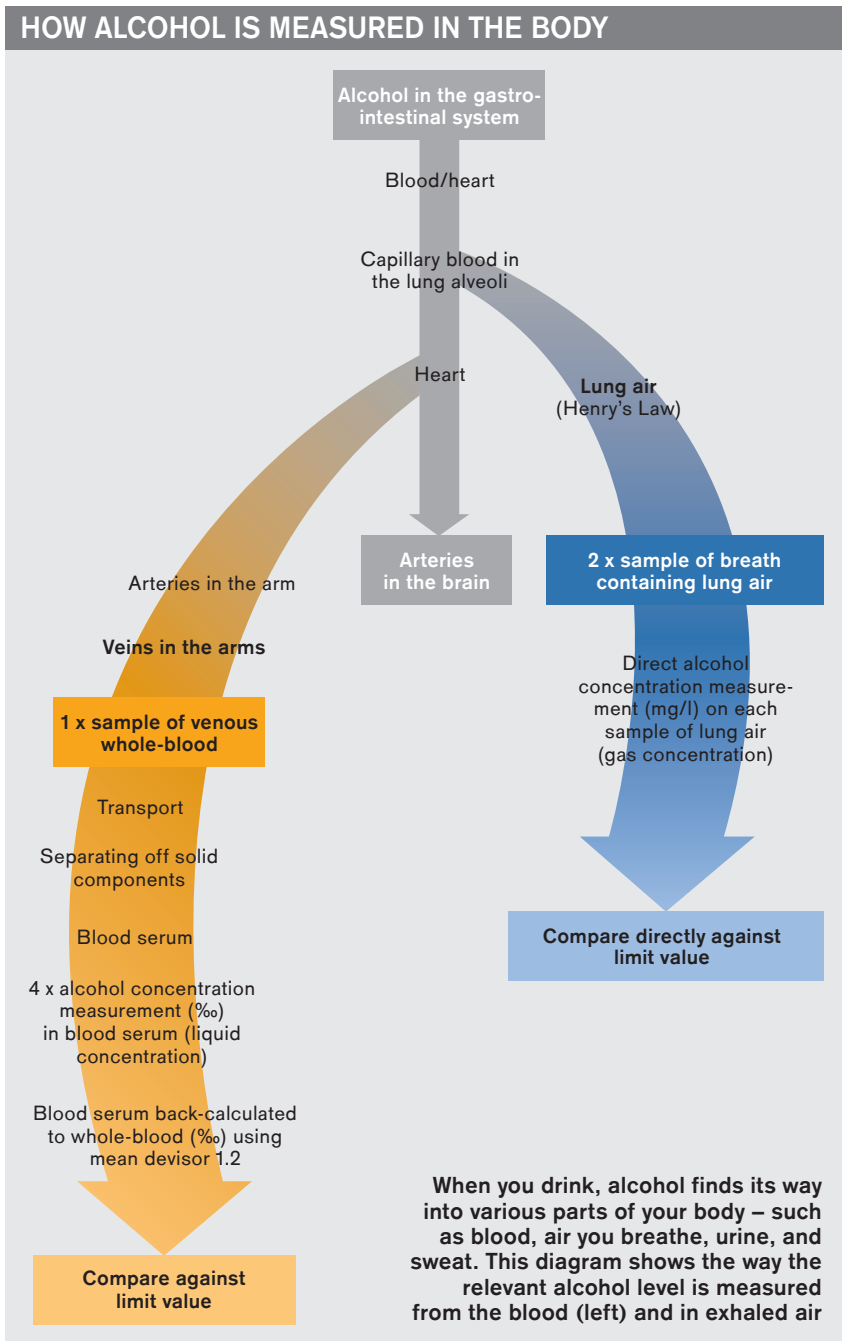
for a breath alcohol monitoring method which could be used as evidence in court. “This was an absolute milestone, since the device’s redundant design guarantees particularly reliable results on a par with blood samples when used as evidence,” says Dr. Sohège. This technology’s capability was confirmed by the *Physikalisch-Technische Bundesanstalt (PTB)*, which approved the Alcotest 7110 Evidential MK III as the first ever breath alcohol measuring device whose readings could be admissible as evidence in court. A similar dual-sensor system is used in the Alcotest 9510 evidential device which was launched in 2007 and which can be used as a stationary or mobile system.

Paradigm Shift in Measurement Strategies

Since 1953, when the first Dräger-Alcotest tubes appeared, engineers are now working on systems with further improved response times to facilitate comprehensive, high-frequency traffic testing. “This is a worldwide trend for the near future,” predicts Dräger’s Product Manager Sohège. Optical filter technology is also being improved in order to produce even more accurate infrared sensors. Transdermal measurements could represent a completely new option in the future, where alcohol concentration in the blood is measured through the skin (see pages 20–21). Unlike breath testing and blood samples, this technology offers the advantage of complete cooperation-free measurement. It would benefit alcohol testing equipment which is used outside of the road traffic



2007
With touchscreen: Alcotest 9510
Evidential measuring device



field, in areas such as emergency medicine where patients could be examined for the influence of alcohol.

But the experts for alcohol measurement think beyond the improvement of existing solutions. It is about a paradigm shift – distancing itself from the subsequent control associated with preventive measure, to preventing the operation of vehicles or critical systems under the influence of alcohol. The purpose of the Dräger Interlock XT.

It is installed in passenger transport vehicles such as buses, taxis, and locomotives so as to make travel safer for passengers. But Alcohol-Interlocks are also being used in automobiles belonging to drivers who have attracted attention by drinking and driving so that they can return to the roads, but under strict stipulations (see also pages 46–49). The first Dräger Interlock, which activates the ignition only after a negative breath test, came onto the market in 1994.

Whether traffic control, Alcohol-Interlock, or long term monitoring, whether electrochemical sensors or infrared technology – each new generation of the breath alcohol testing equipment from Dräger sets new standards in the market, which brings more security in life. The Dräger Alcotest has been doing this since 1953 – ever since the first automobile drivers blew into the Dräger tube and bag to test their breath.

Peter Thomas



Information:
Precise breath alcohol testing
using Dräger devices
www.draeger.com/107/diagnostic

Through the Skin

In the USA, where there is a high alcohol-related crime rate, law enforcement authorities are keen to monitor the parole behavior of **ALCOHOL OFFENDERS** more effectively. They have even resorted to instruments like electronic shackles – or, to use a more delicate term, ankle bracelets.

When the alcohol content is to be monitored continuously and without interruption, random testing is ruled out (blood, breath, or urine tests). These are expensive, they sometimes need medical personnel, and do not cause behavioral change among the delinquents. But measuring alcohol in sweat and alcohol evaporated from the skin is another matter. A small proportion of the alcohol you drink – around five to ten percent – is not broken down in the liver. But instead excreted in the breath, through the skin, or in the urine or sweat. Excretion through the skin is very low at just one percent, but it has a distinct advantage, which is that the quantity of alcohol which passes out of the body by that route gives a clear picture of the alcohol concentration in the body, with a delay between half an hour and two hours. This makes it an easily accessible marker for alcohol consumption.

With a small tamper-proof device, the SCRAM® by Alcohol Monitoring Systems which is attached to the ankle, the measurements can be performed automatically around the clock, and the results are

sent via a transmitter to a central office for analysis. The delinquent has little chance: every violation is followed by immediate reprimand. The inside of this ‘bracelet’ is technically complex. “Measuring alcohol through the skin works by the same principle as breathalyzing: using an electrochemical fuel cell,” explains Dr. Jürgen Sohège, Product Manager at Dräger. “The device takes half-hourly samples from the ‘air cushion’ next to the skin. Inside an electrochemical sensor, the alcohol is converted into an electrical signal which can be evaluated.” Tens of thousands of these devices are now in use in America, and the feedback has been positive, with three out of four offenders sticking to the terms of their paroles. But there is an even tougher approach whereby delinquents are subject to stricter terms such as house arrest, which is enforced using the GPS transmitter in the device. As many as 90 per cent of these people monitored adhere to the rules of their paroles.

With Light in the Skin

Measuring alcohol is not always a case of tracking and penalizing alcohol-related offences. A large demand could

also arise in the area of prevention. This can be in traffic, for general safety reasons drinking and driving should be prevented, but also in the professional environments, if certain machines require complete sobriety. In all these cases, you can’t stigmatize and restrict innocent people by having them wear an alcohol detector.

For this purpose, the breath testing before starting a vehicle equipped with the interlock system is already a reality (see also pp. 46–49). But optical methods of measurement are also conceivable which measure the alcohol content in the body through the skin – on your finger for instance. In the USA there is a broad-based research alliance known as the Driver Alcohol Detection System for Safety (DADSS) in which optical methods employing near infrared light (NIR) are employed in measuring devices used in cars. The electromagnetic waves, which range in frequency from 0.7 to 2.5 µm, penetrate up to five millimeters into the skin when a finger is placed on the sensor. The light waves are reflected by the tissue and analyzed, producing a figure of tissue alcohol concentration – and if necessary, preventing

PHOTOS: JFX IMAGES/COLOURPRESS.COM, ACTION PRESS/BAUER-GRIFFIN, BARTEE PHOTOGRAPHY/SCRAM (2)



The SCRAM ankle bracelet continuously monitors the alcohol level of a delinquent



“Captive” U.S. actress Lindsay Lohan was caught drunk at the wheel – and had to wear an ankle bracelet. Right: Andy Dick at a film premiere in Los Angeles (2009)

An Arresting Idea

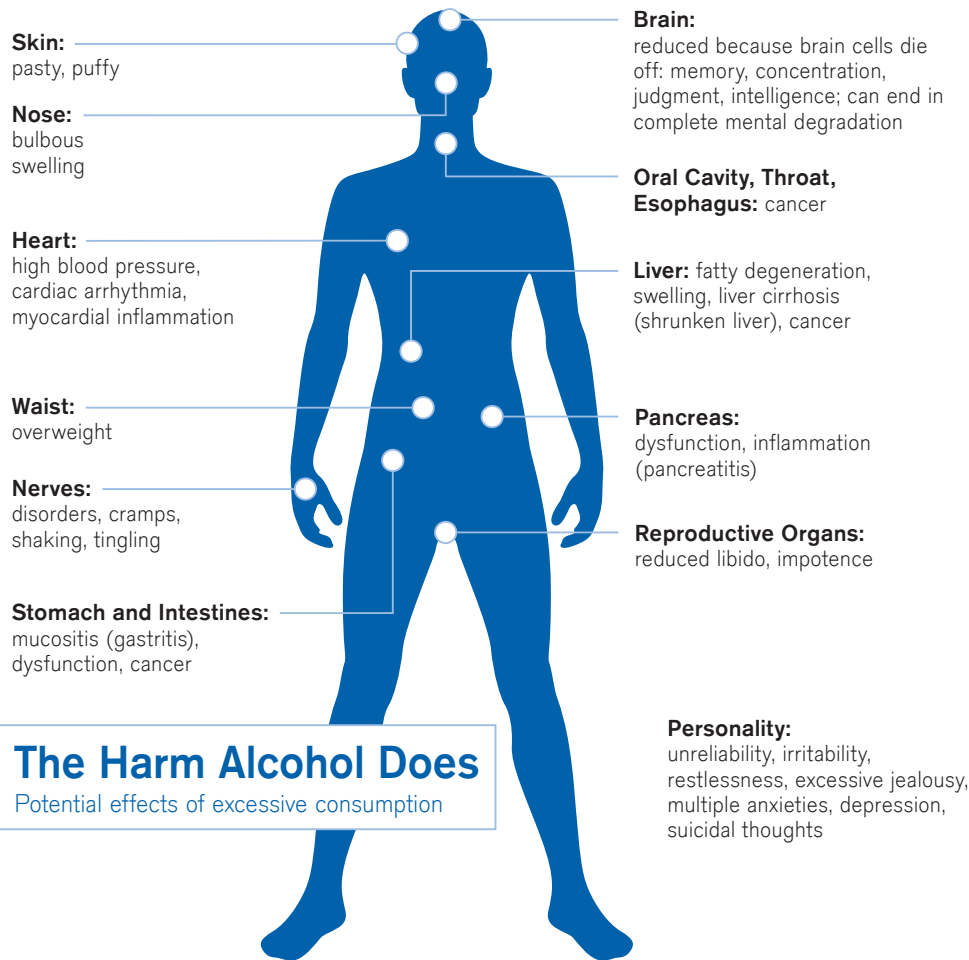
Who sins, will be punished. But still it can be milder: an adjudication that relies on understanding and behavioral changes. One means to this is continuous (24/7) monitoring of compliant behavior using an ankle bracelet, such as this SCRAM (Secure Continuous Remote Alcohol Monitor). Every 30 minutes the device measures the alcohol secreted through the skin, sending the figures – together with temperature readings – to a central server, either directly via an integrated mobile chip, or via a base station.

the car from starting. There is already a table-top device based on this technology, the TruTouch® 2500 made by TruTouch Technologies, which is used preventatively in high-risk working areas to ensure that every employee is completely sober before starting work.

“Even when the near-infrared technology is not fully developed, it shows interesting possibilities for the future,”

says Dr. Sohège. One company in Hamburg, Germany (Dermalog Identification Systems GmbH), is also busy developing transdermal alcohol measurement on the basis of near infrared technology. In her initial experiments, the physicist Clarissa Hengfoss has demonstrated that it is possible to measure tissue alcohol in the finger using spectroscopic means. There are however technical difficulties

when it comes to using this method in practice, such as light dispersion in the tissue, the spectral overlap of alcohol with those of proteins and fats, as well as an unsatisfactory calibration – it’s still very expensive. “We have come a long way, but it will take some time before we have a device which can be used in everyday situations,” says Managing Director Günther Mull. **Regina Naumann**



The Harm Alcohol Does

Potential effects of excessive consumption

Pure Nerves

Minor cause, big effect: even small quantities of alcohol can limit your **COORDINATION AND REACTIONS**.

For many people, alcohol is simply part of life. A glass of wine frees up the thoughts, a round of beer makes merry. Yet the mildly disinhibiting effect of an alcoholic drink (one international ‘Standard Drink’ contains ten grams of ethanol) is nothing other than the first stage in a complex process affecting the central nervous system (CNS): ethanol molecules build up in the proteins of nerve cells and alter their function. Ethanol has a particularly strong effect on the ion channels, which are responsible for transmitting signals along the body’s system of neurons and muscle cells. Certain stimu-

lus transmission routes are amplified, but most are suppressed. The brain, for instance, loses its ability to recognize and assess dangerous situations properly. A study by the National Institute on Alcohol Abuse and Alcoholism in Maryland, USA, revealed this effect on the brain using magnetic resonance tomography.

The effect begins about two minutes after the first drink is consumed and increases in proportion to the alcohol concentration in your blood as you drink – leading eventually to serious disorders. Subjectively, ethanol is at first stimulating, numbing, and warming. Higher doses can lead to overestimating

yourself, aggression, and a reduction in your capacity to think, speak, and see. Finally dizziness and unconsciousness occur. The threshold at which coordination and reactions are impaired may be relatively low in some people. In the words of the Institute for Occupational Safety and Health of the German Social Accident Insurance, in its GESTIS substances database: “The performance of the CNS can be impaired by blood ethanol concentrations of 200 to 300 mg/l (0.2 to 0.3 per mille), and from 0.6 to 0.7 ‰ upwards, the majority of people are significantly affected.

Carousel of Senses

Some effects consist of variously combined symptoms. The dizziness which comes with intoxication is caused on one hand by a neurologically disturbed reconciliation of those senses required to maintain a feeling of balance. The positional dizziness of drunkenness, on the other hand, is caused by the diffusion of ethanol into what is known as the ampullary cupula belonging to the organ that senses rotation. Normally speaking, the cupula and the lymph surrounding it have the same specific weight. At alcohol levels of 0.3 ‰ and upwards, the specific weight of the cupula decreases so markedly in comparison with the lymph that it begins to respond not only to rotational movements, but to changes in the head’s position. This is what produces a sense of dizziness, which can also occur under reversed conditions as the ethanol is broken down.

Peter Thomas

GRAPHIC: PICFOUR

Rise of the Synthetics

The narcotics scene is always changing – new substances appear continually on the market, especially **SYNTHETIC DRUGS**, sold as ‘bath salts’ are spreading fast. Their effects have even shocked experienced physicians.

Bath salts, spice, plant nutrients: they may all sound harmless, but in essence they are life-threatening. Alongside conventional narcotics, ‘legal highs’ sold under fancy names are playing an increasingly important role in the drug market. This group of synthetic substances is only legal for the reason that they have not yet been banned, and in many countries much is being done to make them just that. Yet chasing synthetic drugs is rather like the race between the hare and the tortoise, since producers are putting new things onto the market faster than existing mixtures are being prohibited. In Germany the sale and consumption of a drug cannot be banned until the substance involved is listed under the *Betäubungsmittelgesetz*, or Narcotics Act. What is more, substances branded as bath salts and smoking blends are sold explicitly for non-human consumption – which makes quick prohibition difficult, including in the USA.

Regional Trends

The problem is becoming ever more pressing: 57 new variants of synthetic drugs were discovered in 2012 alone, according to the European Monitoring Center for Drugs and Drug Addiction (EMCDDA) in its annual report. Three years previously it had been just 24 new substances. EMCDDA President Wolfgang Götz is therefore warning of a boom in products. An international register, he says, is urgently needed to prevent more effectively the spread of

psychoactive substances. A quick look at the new synthetics reveals a very heterogeneous picture, because even if their effects are often similar to those of known narcotics, most of them are fundamentally chemical. This is true for the synthetic cannabinoids, which dock at the cannabis receptors in the brain and are primarily in herbal smoke blends. Synthetic cathinones on the other hand are sold in products referred to as bath salts. The toxicity and intensity of these ‘legal highs’ are often many times those of conventional drugs, for which reason their psychological and

physical risks are much higher than the known effects of established drugs, sometimes exponentially higher – as when products available on the market are combined with one another.

A good few horror stories have been circulating around the effects of substances like mephedrone and methylenedioxypyrovalerone (MDPV) contained in ‘bath salts’. In the USA, reports the *New York Times*, a man climbed up a pole at the side of a road and jumped down into traffic, another entered a monastery in his state of intoxication and stabbed a priest to death. **Peter Thomas**



Under false pretenses: Drug producers are attempting to get around state bans with an increasing number of new substances. This includes also this herbal mixture with drugs which is intended neither to spice your meal nor to make camomile tea. They are all about getting high – which is why these samples landed in the Chemistry Department of the Office of Criminal Investigation in Frankfurt a. M., Germany

PHOTOS: PICTURE ALLIANCE, STAR-MEDIA

The Trail of Saliva

Conventional blood and urine tests are time-consuming and sometimes misleading when it comes to rooting out drug offenders on the roads. In Belgium the police have been sifting woozy drivers out of traffic for some years using **MODERN SALIVA TESTING** – and in Australia you may well be subjected to on-the-spot screening at work.

Ross Rebagliati wrote sporting history twice over. The Canadian snowboarder won the giant slalom at the 1998 Winter Olympics in Nagano, Japan, becoming the first Olympic gold medalist in this sport. He also became the first Olympic athlete to be found guilty of cannabis consumption. He got lucky, since at the time of the competition smoking dope had not yet become punishable. Rebagliati remains on the eternal list of winners.

Today the hemp plant called cannabis is firmly on the banned substance blacklist, whether in the form of pressed resin (hashish) or dried buds (marijuana). This is not because it massively enhances the performance of the human body, but because its active substance, tetrahydrocannabinol (THC), makes athletes more willing to take risks. This can be dangerous, especially on steep slopes. “Anyone who smokes pot, skates with more risk!” warned the Swiss Department for Alcohol and other Drug Problems back in the year 2002 in reference to the little intoxicating pipes. Anyhow, fans tease that one of the most attractive snowboard disciplines may still be called the “half-pipe”.

Limits for Drugs


Cannabis is the most widely consumed ‘illegal’ drug in the world. According to estimates by the United Nations Office on Drugs and Crime (UNODC), up to five percent of all people between the ages of 15 and 64 smoked a joint at least once in the year 2010. That is the

equivalent of one in every 25 people on earth. Hard drugs like heroin, cocaine, and ecstasy are taken by far fewer people (see Table 1).

The highways are another arena where, with the exception of alcohol, no other drug is as widespread as cannabis. This was shown by a study published in 2011 by the German Federal Highway Research Institute and entitled DRUID (Driving Under Influence of Drugs, Alcohol, and Medicines). During the study almost 50,000 automobile drivers in Europe were stopped on the open road and tested for alcohol, illegal drugs, and medications. The authors recommended in the study to introduce limits for the drug-related driving impairments. As there is with alcohol.

But that is easier said than done. As for alcohol, there are not only established limits, but also portable and easy-to-use breath alcohol tests that allow legally actionable analysis directly on-site (see also pages 14-19). On the other hand, for example drug testing by German Police Officers – in cases of suspected drivers – extravagant blood tests are arranged. In contrast, urine samples have only “limited relevance”. Meanwhile the call for new test procedures has become louder in the USA. “While drugged driving arrests are on the rise, our police force needs a breathalyzer-like technology that works to identify drug-impaired drivers, on-the-spot, before they cause irreparable harm,” urged U.S. Senator Charles Schumer in January 2012.

PHOTOS: DRÄGERWERK AG & CO. KGAA



Fresh from the blisterpack: a porous sampler ready for drug testing



It's enough:
A color indicates
there is enough
saliva for analysis

**Hygienic in the
laboratory:
the DCD 5000
with sampler
below and
holder above**



Although drugs and medicaments leave behind clear traces in the human body, most bodily substances are not suitable for quick mobile testing. In the hair and nails, for example, intoxicating substances can still be proven months afterwards. But they say as little about the exact time at which a substance was swallowed, inhaled, or injected as the sweat plasters that have to be left for days on the skin to take effect.

Human blood, however, is a different matter altogether: it supplies

quick results since it absorbs addictive substances immediately after they have been taken, and distributes them around the whole body. Because every human's blood is very much the same in its chemical composition, and because it cannot be manipulated while it is being sampled, blood analysis is a very reliable technique. Finally, the concentration of a substance in the blood provides a direct statement about the intoxicating effect of the drug in the central nervous system. And yet there is one major drawback when it comes to spontaneous traffic checks: blood sampling is invasive and can only be done by qualified medical personnel.

Table 1:
Global consumption of illegal drugs

Drug	Consumption [In Percent: 1.), 2.)]
Cannabis	2.5–5.0
Opioids (e.g. heroin)	0.6–0.8
Opiates	0.3–0.5
Cocaine	0.3–0.4
Amphetamine-like stimulants	0.3–1.2
Ecstasy	0.2–0.4
Other drugs	3.4–6.6

Source: UNODC 2012

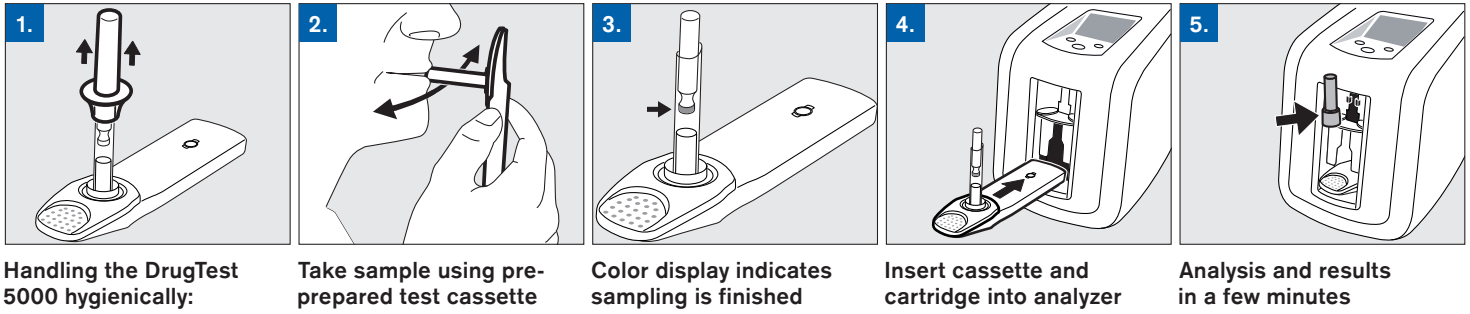
1.) = key question: what proportion of people between the ages of 15 and 64 consumed this drug during the past 12 months?

2.) = minimum and maximum estimates

Cannabis is the most widely consumed 'illegal' drug in the world. According to estimates, as many as five percent of all adults worldwide have smoked at least one joint in their lives. Hard drugs like heroin, cocaine, and ecstasy are taken much less widely

Efficient Saliva Testing

Urine sampling, which is often used as a pretest before blood sampling, is only of limited use when it comes to reliable and quick drug screening. It must be done out of sight in order to protect the person's privacy, so it is easy to manipulate. Another problem is that it produces a lot of false-positive results which then cause unnecessary blood tests. The reason for this is that the metabolic byproduct of the active ingredient in cannabis (THC) produces a positive result in a urine test for much longer than the active substance itself. This means a greater risk that the subsequent blood test will have no legal validity, since courts only recognize direct evidence of THC as proof of somebody's inability to drive. Demonstrating the metabolic byproduct alone is legally irrelevant. >



> In Belgium, the false-positive rate caused by urine testing rose at a certain point to 15 percent. This meant, strictly speaking, that traffic police were taking one in seven blood samples for nothing – a troublesome fact for drivers and officers alike. For many years there wasn't an alternative to this practice. But the country is now pioneering a new approach, having established saliva testing legally in 2010. Since then, traffic checks on suspected drug consumers in Belgium have followed a strict procedure: if a driver attracts attention then a saliva test is performed on the spot. If the concentration of a particular substance exceeds a certain threshold (see Table 2) then a second saliva sample is taken and sent to a laboratory for confirmative analysis. If the driver refuses to cooperate or is unable to perform the test, then a blood sample is taken at the nearest hospital. Studies show that the number of drivers proven to be incapable of driving has risen since the introduction of the saliva test. Also in France, the saliva test has now been established into law. Likewise in Spain, where there are currently no mandatory limits.

To the Point

Saliva is similar to blood in its suitability for drug testing. It consists of around 99 percent water, which comes out of the blood vessels into the saliva glands, bringing with it many soluble substances into the mouth and throat – including the active substances in drugs. As with blood, clear indications



0.28 milliliter of saliva will suffice to prove the presence of various drugs, with the Dräger DrugTest 5000 (see below), in a short time – such as here in Australia



The device is designed for simple and hygienic to use, and operates independently – even under harsh conditions

PHOTOS: DRÄGERWERK AG & CO. KGAA

THC can be detected in the saliva for as long as the effects remain

about the time of drug use, as well as the intoxicating effect can be understood. On top of that, samples are easy, quick, and reliable to take. Even for the drug THC, which passes only a very small amount out of the blood into the saliva; this method is suitable as the active traces of THC accumulate during smoking in the mucus. The proof can it be detected as long as the effect of the drug continues in the body.

Almost like an Assembly Line

Furthermore, the latest saliva testing equipment, such as the Dräger DrugTest 5000 introduced in 2008, produces very reliable results. This device can detect very small quantities of active substances (THC: five nanograms per milliliter), and it pinpoints the time of drug consumption within a time window of up to eight hours, while only requiring a saliva sample volume of just 0.28 milliliters. “This makes it very easy to determine whether a person has taken one or more drugs recently and is still influenced by them,” says Dr. Stefan Steinmeyer, responsible for the subject matter of “Drug Testing” at Dräger.

As well as the technology, the legal basis has to be right. Saliva testing has so far only been carried out on a mass scale in Australia. There, since 2004, drug testing has been pushed harder by the law than in any other country. But then again, nowhere else is cannabis consumption so high. According to the UNODC, at least one in nine adults smoked at least one

joint in Australia and New Zealand in 2012. No other region ranks so high as this. Checks in Australia start with the highways. Unlike in Belgium, the police do not test on suspicion, but instead systematically as a deterrent. Between 2004 and 2009 in the state of Victoria alone, more than 100,000 drivers were tested for drugs. On-the-spot saliva testing at the roadside is done almost like an assembly line basis (see also Dräger Review 104; page 16 ff.).

Random sampling is also on the rise at work, as Michael Wheeldon explains. He is Managing Director of the drug test service provider Integrity Sampling Pty Ltd. The company was founded in 2001 with the aim of testing employees on behalf of their employers. The proportion of people testing positive is around two percent, much like on the roads. “The number of tests has risen steadily over the past ten years,” says Wheeldon. “In 2012 we used Dräger equipment to perform around 35,000 alcohol and drug tests.” In the beginning it was primarily mine operators who commissioned the company. Nowadays requests come from all kinds of safety-relevant industries.

The manager does not fear a drop in demand. “Australian employers are legally bound to ensure the safety of their employees in the workplace.” This includes seeing that everyone in the team really is sober. **Frank Grünberg**



The EU DRUID program:
On-the-spot drug testing equipment for safer roads
www.draeger.com/107/ddt5000

Table 2: Drug Testing in Belgium: detection limits (known as 'cutoffs') in ng/ml

Substance	Pretest	Confirmation	
	Saliva	Saliva	Blood (Plasma)
THC (Cannabis)	25	10	1
Amphetamines, Ecstasy	50	25	25
Opiates	10	5	10
Cocaine, benzoylcgonine	20	10	25

Source: DRUID – Oral fluid and blood confirmation compared in Belgium. Van der Linden T, Legrand SA, Silverans P, Verstraete AG. J Anal Toxicol. 2012 Jul;36(6):418-21

Traffic checks of suspected drug consumers in Belgium follow a strict procedure: if a driver attracts attention then a saliva sample is taken. If substance concentration exceeds a certain threshold then a second, stricter saliva test is performed. If the driver refuses to cooperate then a blood sample is taken at the nearest hospital

Table 3: Cannabis consumption by region

Region	Consumption (%)
Oceania	9.1–14.6
North America	10.8
West/Central Africa	5.2–13.5
Western/Central Europe	7.0
Asia	2.2

Source: UNODC 2012
Key question: how many people between the ages of 15 and 64 have consumed this drug during the past twelve months?

In Australia and New Zealand, at least every one in nine adults smoked at least one joint in 2012. No other region has such a high figure

Risks and Side Effects

A chain is only as strong as its weakest link, and **SAFETY PRECAUTIONS** are only as effective as the people who take them. If those people numb their senses they endanger not only their own safety.

If you had drunk a bottle of wine, would you trust yourself to distinguish with certainty between a runway and a country road? Or would you still sit yourself behind the wheel of your car? Any sensible person would present “no” as the answer. But in 1968, the German weekly *Die Zeit* reacted with horror to a draft act proposed by the Federal Council which looked to reduce the blood alcohol limit for drivers from 1.3 to 0.8 per mille (see pages 42–45). “A pattern of futility” wrote the newspaper, grumbling that citizens were to be denied the freedom to judge their own ability to drive, and bemoaning blanket punishment for everyone with a quantity of alcohol in their blood, even those who could still drive properly. The subjective assessment of the danger at that time was a lot.

Hashish in the Driver’s Seat

Today we know that assessing one’s own ability to drive after drinking still resembles a game of dice. Sometimes you win, sometimes you lose. While one pilot may be able to land his aircraft after several glasses of vodka and lines of cocaine as Denzel Washington did in “Flight”, another will miss the runway even with a hangover. Autopilots cannot replace an attentive pilot, and automobiles crammed full of airbags cannot prevent a head-on collision.

In 2008 a Russian passenger aircraft crashed just short of its destination onto the tracks of the Trans-Siberian Railway. The pilot’s inebriation cost 88 people their lives. The devas-

tating oil-spill off the coast of Alaska, on the other hand, can hardly be blamed on the captain of the tanker Exxon Valdez, which ran onto a reef in 1989. He was lying drunk in his cabin while his crew was busy causing one of the biggest environmental catastrophes in maritime history. Two years previously an Amtrak train travelling at 110 mph crashed into a line of Conrail locomotives in Maryland, USA. Sixteen people died and 170 were injured. Eighteen minutes beforehand the crew of the Conrail convoy had smoked a joint and overlooked a signal. An alcoholic and drug-addicted engineer was later held principally responsible for the accident.

Every possible technical safety risk is considered today. Machines are designed for optimal interaction with people who have played through situations and variants and scenarios designed to make the incalculable as predictable as possible: humans. The blood alcohol limit is now down to 0.5‰ in Germany as well as other countries. In many Slavic and Baltic nations, auto-drivers have to abstain entirely – and rightly so, believes the doctor of psychology and addiction researcher Michael Klein of the German Institute for Addiction and Prevention Research at the Catholic University of North Rhine-Westphalia. “The problem with alcohol is that you don’t notice its effects until after it has begun to change your perception.” This, he explains, takes place well before the obvious rush, and sometimes from 0.3‰ onwards.


The problem that makes people on the road and in all relevant safety areas >



PHOTO: ULLSTEIN BILD - STILL PICTURES/AL GRILLO

Facts and Figures

- ▶ Alcohol is involved in more than one in ten road deaths in Germany
- ▶ Medicaments and drugs play a part in between 14 and 17 percent of all worldwide traffic accidents causing death and injury
- ▶ In North America, the number of drivers under the influence of illegal drugs exceeds the number of drunk drivers
- ▶ The combination of drugs or medicaments and alcohol significantly increases the risk of being injured or killed



Oily consequences:
the drunken captain of the
Exxon Valdez caused
one of the greatest
eco-disasters of all time

Nervous Contestants

The sympathetic and parasympathetic nervous systems are part of the autonomic nervous system, acting in opposition to control important bodily functions.

> a risk is the disinhibiting effect. Things which are inhibited in a normal setting would be released due to drugs. Take for example somebody's unwillingness to perform a risky overtaking maneuver, which falls away because the fear is blocked. "Human behavior is a balance between initiating things and feeling inhibited," says Michael Klein. "Socially well-adjusted people have acquired a high degree of control over their aggression. But this control is restricted by

the consumption of alcohol and other drugs. This in turn allows the initiation of other actions, enabling certain types of behavior which would otherwise not occur."

Emotions Unrecognized

A study by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in Maryland, USA, illustrates the way in which alcohol can manipulate the brain.

Using magnetic resonance tomography, researchers examined the way emotions are processed. One group of participants was given alcohol by infusion, another group saline solution. Both groups were then shown a series of facial expressions, and while their brains were scanned continuously. In certain areas of the brain, clear differences could be seen in the way the sober subject group reacted to neutral and frightening expressions. These differences could not be detected in the drunken group. Intoxicated people fail to recognize threats coming from other people – and are unable to develop strategies to avoid conflict.

Similar results were produced by a study at the University of Granada in Spain, showing that people under the influence of drugs have difficulty understanding the emotions expressed in the face of the person opposite. The more intensive consumption in the past, the more difficult it became to recognize rage, anger, and fear. A further Spanish study revealed neuropsychological impairments of memory, the processing of feelings, and the ability to make decisions in 70 percent of the drug addicts – regardless of whether they had consumed alcohol, cannabis, amphetamines, or cocaine.

The consequences are foreseeable not only for high-risk occupations. The danger of misreading certain situations makes people who have consumed drugs or alcohol a risk at football matches, at demonstrations, and in their general daily interactions. On top of that there is a change in character and the tendency to violence which alcohol brings

Central Nervous System:

Drive
Attentiveness

Bronchia:

Expansion

Heart:

Frequency ↑
Strength ↑
Blood pressure ↑

Gastrointestinal System:

Peristalsis ↓
Sphincter tone ↑
Circulation ↓

Eyes:

Pupil dilation

Saliva:

Limited, viscous

Liver:

Break down glycogen
Release glucose

Bladder:

Sphincter tone ↑
Wall muscle tone ↓

Skeletal Muscles:

Sphincter tone ↑
Wall muscle tone ↓

Sympathetic Nervous System

Fight/Flight

about. “The question of whether someone is violent or not is a matter of probability. The problem is that many people basically concede the right to be aggressive under the influence of alcohol,” says Addiction Researcher Klein. Not that this is the case everywhere. In Islam, and in Chinese society, offences committed under the influence of alcohol are excused less readily than they are in a country like Germany. “The Americans call this “German discount” – if you’re very drunk you’re considered only partially sane – and therefore not fully accountable.”

In many areas, the security risks posed by people under the influence of psychotropic substances, are now met with strict prohibitions, as well as alcohol and drug testing. In aviation for instance, there is a worldwide ban on alcohol for ground and flight crews, and attempts to enforce this internationally include unannounced tests. Depending on the country and the contract of employment, pilots may be obliged not to consume any alcohol a certain number of hours before they begin work. Yet testing rarely happens, and even the annual medical examinations that take place provide only limited insight into potential addiction.

Seems even more crucial because the general understanding of the risk, as confirmed by Markus Wahl of the German pilots’ union, Cockpit: “We all have the claim to operate safely. This is the highest priority.” He considers the interpersonal realm more important than irregular testing. “It is obviously irritating when

the pilot on the seat next door slurs or smells of alcohol. Already with strange decisions, without further suspicion, you begin to wonder.” Part of pilot training is to recognize such things, bring them up, and not sweep them under the carpet out of some misguided sense of embarrassment. Young pilots also have to be able to broach the subject with more experienced colleagues and take action – “Regardless of the consequences – even if the flight is cancelled!”

Many Regulations, Few Standards

The law is inconsistent – in Germany, but also internationally. From the potential threat posed by the operation of a chemical plant, for example, to the activity carried out by an excavator operator, or outright of occupational health and safety regulations, resulting in a diffuse ban to consume drugs or alcohol during work hours. Then there are simple occupational safety and accident prevention regulations. These apply to people like drivers of hazardous mate-

rial vehicles and people who transport passengers, as well as the police, firefighters, and rescue workers. Most high-security professions are governed by nation-specific regulations, but rarely by international standards. Under pressure from Germany, the International Maritime Organization (IMO) did impose in 2010 a limit of 0.5 per mille for all persons who bear responsibility on a ship. Many other areas are less clear and governed only by individual working arrangements. These may include drug screening and alcohol tests as contractual duties, but they fail to make people more predictable.

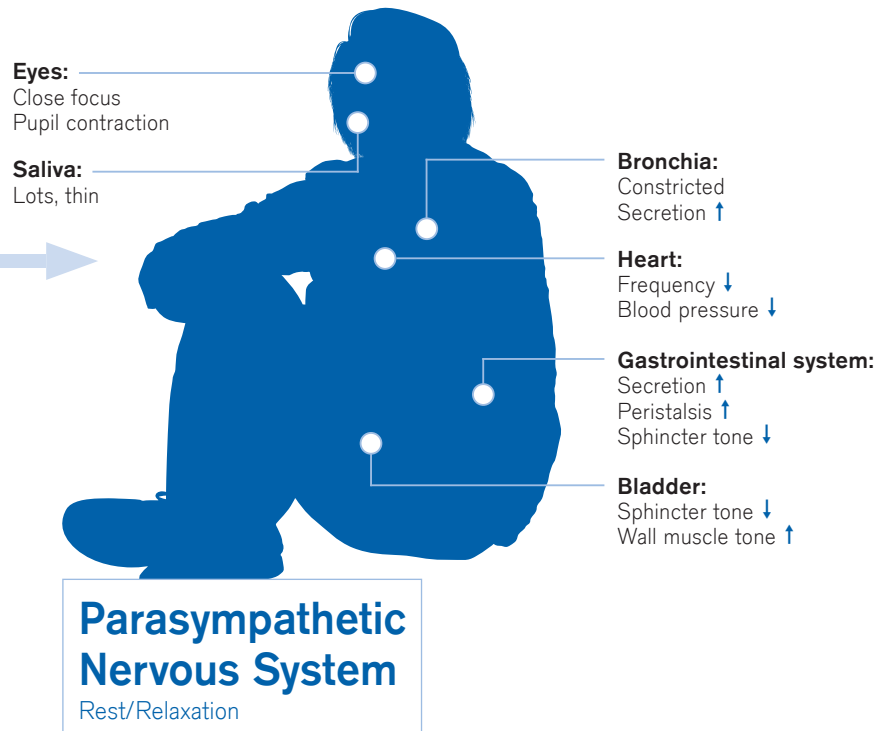
Isabell Spilker

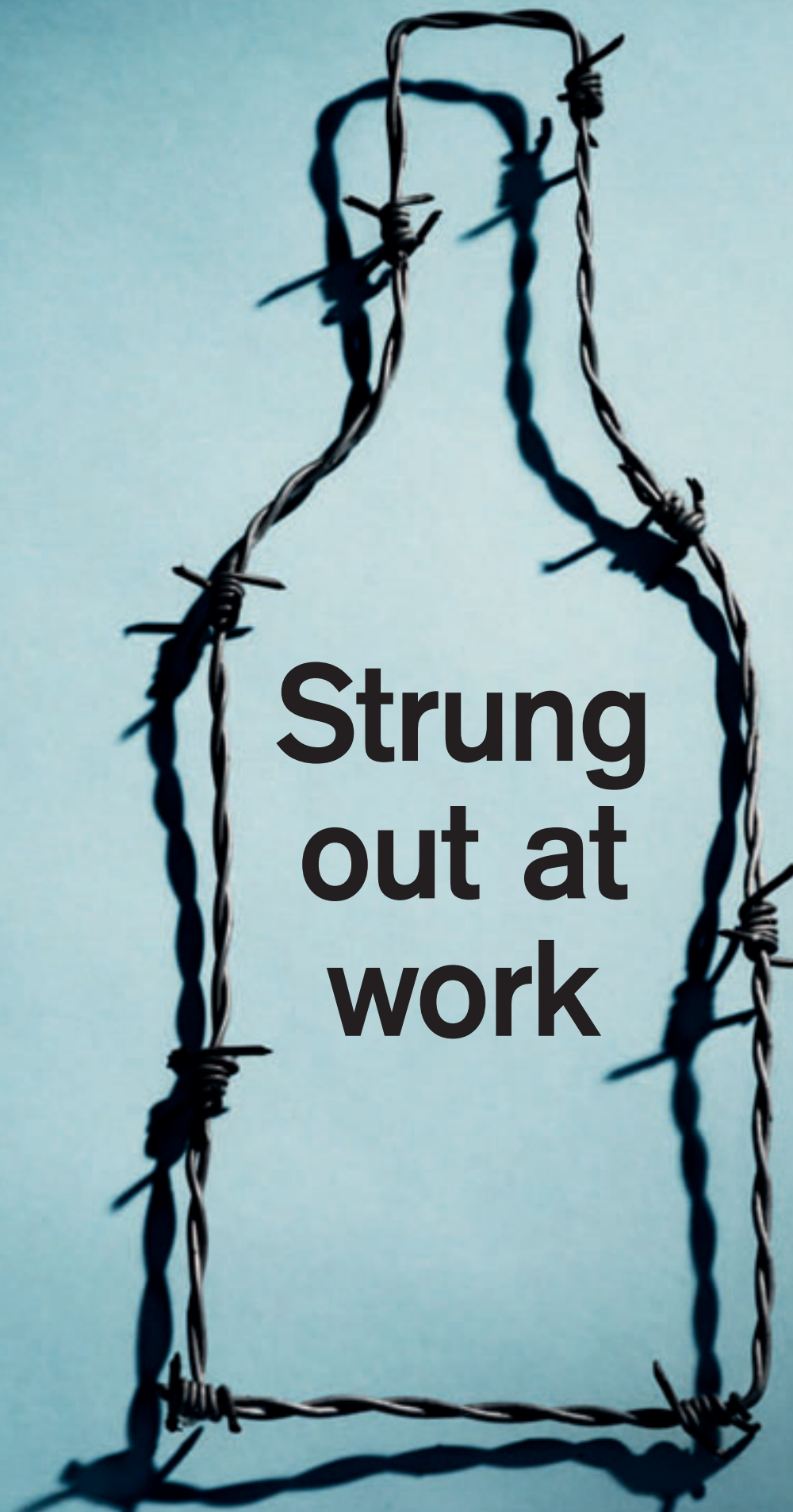
Links

► Project DRUID (Driving under the Influence of Drugs, Alcohol and Medicines): www.druid-project.eu

► Study: “Why we like to drink”, NIAA, Maryland, USA, published in the Journal of Neuroscience: <http://www.jneurosci.org/content/28/18/4583.short>

► Study: “Alcohol and fear-potentiated startle: the role of competing cognitive demands in the stress-reducing effects of intoxication”, published in the Journal of Abnormal Psychology: <http://psycnet.apa.org/journals/abn/107/4/>



A bottle shape is formed by a single strand of barbed wire, with the sharp points of the barbs visible. The wire is set against a solid, light blue background. The bottle's neck is at the top, and the body is wider at the bottom. The text 'Strung out at work' is centered within the bottle's body.

Strung out at work

Alcohol dependency
can be like a prison –
as the loss of reality,
that makes you lonely

Whether hard liquor before work, a glass of prosecco at lunch, the joint added to the “crime scene” or the daily line of coke in the company’s restroom: work, alcohol, and drugs do not work well together – especially when **SAFETY AND EXPERTISE** suffer. Workplace intoxication can present difficult situations for superiors, colleagues, and the addicts themselves.

On Mondays the dyers skipped work. Clothing colored with indigo hung on the lines, waiting for the sun to turn the dye into a brilliant blue. A little way away the wage workers lay around in the grass chewing the fat. Since the chemical process by which indigo becomes blue required a lot of urine, they downed large quantities of alcohol.

Four hundred years later, Ludwig Eickemeyer* had a blood alcohol level of 1.8 per mille when he crashed his motor-vehicle. He was coming home from a night shift. He was not a dyer, nor had he drunk anything that morning; but his blood was carrying enough residual alcohol to knock most people out. It was the normal state of things for the mining electrician, and not just on Mondays. This went on for 18 years.

Driver’s License Traded for a New Life

That there was no accident caused by him during this period, borders on a miracle. Up to 30 percent of all mishaps at work take place under the influence of alcohol or other drugs. According to estimates by the German Center

for Addiction Issues (DHS), a nonprofit organization dealing with addictions, at least five percent of all employees in Germany are alcoholics. The International Labor Organization (ILO) suspects that up to 25 percent of workers worldwide drink enough alcohol to be considered at risk.

For businesses, the economic consequences are considerable. German employer associations calculate that damage to the economy caused by the consumption of alcohol at work amounts to 15 billion euros, while more pessimistic estimates cite 30 billion. Each year 92,000 Germans are declared unfit to work on account of alcohol-related addictions or psychoses. As consumption increases, employees miss work up to 16 times more frequently and forfeit 25 percent of their working capacity. There are no comparable, statistically backed figures describing the effects of cannabis, cocaine, heroine, or other intoxicating substances taken at the workplace. It is estimated that between 5 and 7 percent of employees take drugs with some degree of regularity.

Ludwig Eickemeyer never stood out. Among friends he was the buddy who liked a drink or two. He did his job in a way that meant no one was bothered by his addiction – neither his colleagues nor his superiors. “At a certain level I could do all of my work so that everyone was satisfied,” says Eickemeyer. “But I may have never been below 1.2 per mille during this time. I needed it to function.” Up to this small, harmless accident after work, where the police took away his driver’s licence – and gave him a new life.

Co-Alcoholism Encourages the Disease

“Sometimes I feel shocked and sad when I reflect on how I could have done everything differently in my life if my alcohol addiction had been discovered,” says Eickemeyer, today Chairman of a support group in the German Ruhr area.

Recognizing people’s dependency on alcohol or other drugs, and helping them, is therefore one of the main themes of global campaigns and projects around addiction at work. When col- >

Clear guidelines aimed at helping addicts out of their dependency

> leagues and superiors tolerate addictions, this is known as co-alcoholism, and it can extend to ignoring addiction-related absence or even covering it up, burdening business operations and encouraging the illness itself. Managerial staff are legally bound to protect the safety and health of people working under them, which means relieving addicts of their work and requesting that they seek help.

For colleagues and more especially for superiors, it is crucial to take note

of increased unreliability, frequent absences, and mood-swings. “Addicts are masters of camouflage,” explains Sabine Morati*. For 20 years she went to work every day – sober, but suffering from withdrawal symptoms which she made up for by overzealousness. “Never look negative!” Her colleagues at the bank appreciated her, although she was considered ill-tempered. That was a smokescreen. Fritz Lehmann* succeeded in completing his apprenticeship as a roofer even while addict-

ed to heroine. In the evening he stole materials from the company and on the weekend he smuggled drugs across the border. He was in the German Armed Forces, and later as a fitter, regularly on drugs, never facing the consequences. Maybe he was noticed, maybe not, but nobody ever offered him help or committed him to a treatment program.

Increase the Pressure But Don't Forget Your Social Obligations

Germany's statutory social accident insurance body, the DGUV, recommends a clear action plan, for the person in the first steps of consultation and omission to move through to the advanced stage of addiction therapy.

While these actions begin with a focus on resolution (in the hope that the odd slip will be noticed by colleagues who recognize the danger of addiction and the associated risks), if the lapses continue then they advise colleagues to up the pressure in conversations. At the end the DGUV recommends getting addiction experts, employee organizations, management, and people from the addict's private sphere involved to help them see reality – and take action. If their behavior does not change, then official warnings and dismissal are the last resort, and even they should include a reinstatement clause which allows employees to return to their old jobs if they abstain.

This is because the loss of a job can be the worst possible punishment for an addict, usually even

Prevention and Help

- ▶ **Change drinking customs:** To what extent is the consumption of alcohol taken for granted inside the company? Are corporate celebrations always boozy, and is a forthcoming vacation or a business milestone jointly achieved reason enough to crack open a bottle? A general ban on alcohol could make sense, but is not always the solution, since often it merely postpones the problem.
- ▶ **Check what drinks are on offer:** Is the bubbly always at hand in the canteen? That case of beer on the office floor or in the foreman's office at the construction site could be replaced with water.
- ▶ **Teach your staff when and how addiction arises:** The risks of the occasional slip-up, and how a weekend of heavy partying can affect your performance and your willingness to take risks.
- ▶ **Promote health awareness:** Addiction prevention is part of preventative healthcare, which management and factory bosses should encourage among their workforce.
- ▶ **Set up works advisory centers:** It is not possible for every company to have a full-time addiction help, but voluntary helpers trained in seminars and by self-help groups can assist.
- ▶ **Tell people about the therapy which is available:** Contact with addiction counselors, self-help groups and specific therapists can open doors for addicts which by themselves they may not have seen. Nobody can be forced into therapy. But if the pressure is great enough, they will often consent.

In the European Union,
drunken employees
cause around 60 billion
euros of economic
damage – every year



PHOTO: ISTOCKPHOTO

worse than breaking with their families and friends. It was a social obligation to take into account, the option of returning as motivation, according to the DGUV.

Fear of losing one's job is often the reason why addicts and other employees who notice their behavior do not act earlier. Even colleagues with courage often lack knowledge of how to handle such situations. Is their coworker really an addict, or does he just like to have a good time? How do you speak to somebody if you think they can't do their work properly in the state they are in today – and probably tomorrow? People often worry about the consequences their colleagues will have to face. Social abuse perhaps, widespread discrediting – or even getting fired on the spot? Few will know that it is not so much the person's job which is at risk, but rather the insurance provided by professional associations to cover the eventuality of an accident at work, which is forfeited if the employee has alcohol in his or her blood (even a residual amount) or is under the influence of drugs. Dismissal really is the ultima ratio, since addiction is considered an illness and does not represent a reason in itself to get fired.

Universal Approaches, Cultural Differences

Around the world there are countless associations, groups, clinics, and universities working on strategies aimed at teaching employers and employees how to handle the dangers of addiction, >

Only very few companies have the working conditions, the stress, and the cultural environment in mind

- > how to prevent it, and how to deal with alcohol and drug abuse. The approaches are basically universal, although they do display cultural and legislative differences.

“The thing is that there is a triangle of action – three points that encompass and influence the whole affair,” explains Steve Allsop, PhD Expert at the Australian National Drug Research Institute. “You have the individual, the drug, and the circumstances.” To achieve meaningful prevention you have to assess on the one hand the availability of substances – for instance, whether alcohol can be purchased inside the company.

“A person has to be treated in terms of education or therapy,” adds Allsop, remarking, “It is on these two areas that most companies focus worldwide. Only a very few look at working conditions, the stress, and the cultural environment.” But think of this: it is essential to consider the fact that construction workers in assembly or mining jobs, often located far from civilization, have very few opportunities to spend their evenings in a meaningful way.

Strict Bans on Alcohol are Rare

Foremost among preventative measures is education inside companies about the health aspects of alcohol and drug consumption, as well as the far reaching legal, safety-related, and social consequences. In countries such as New Zealand, Australia, and the USA, tight alcohol and drug monitoring

As many as 30 percent of all accidents at work occur under the influence of alcohol or other drugs

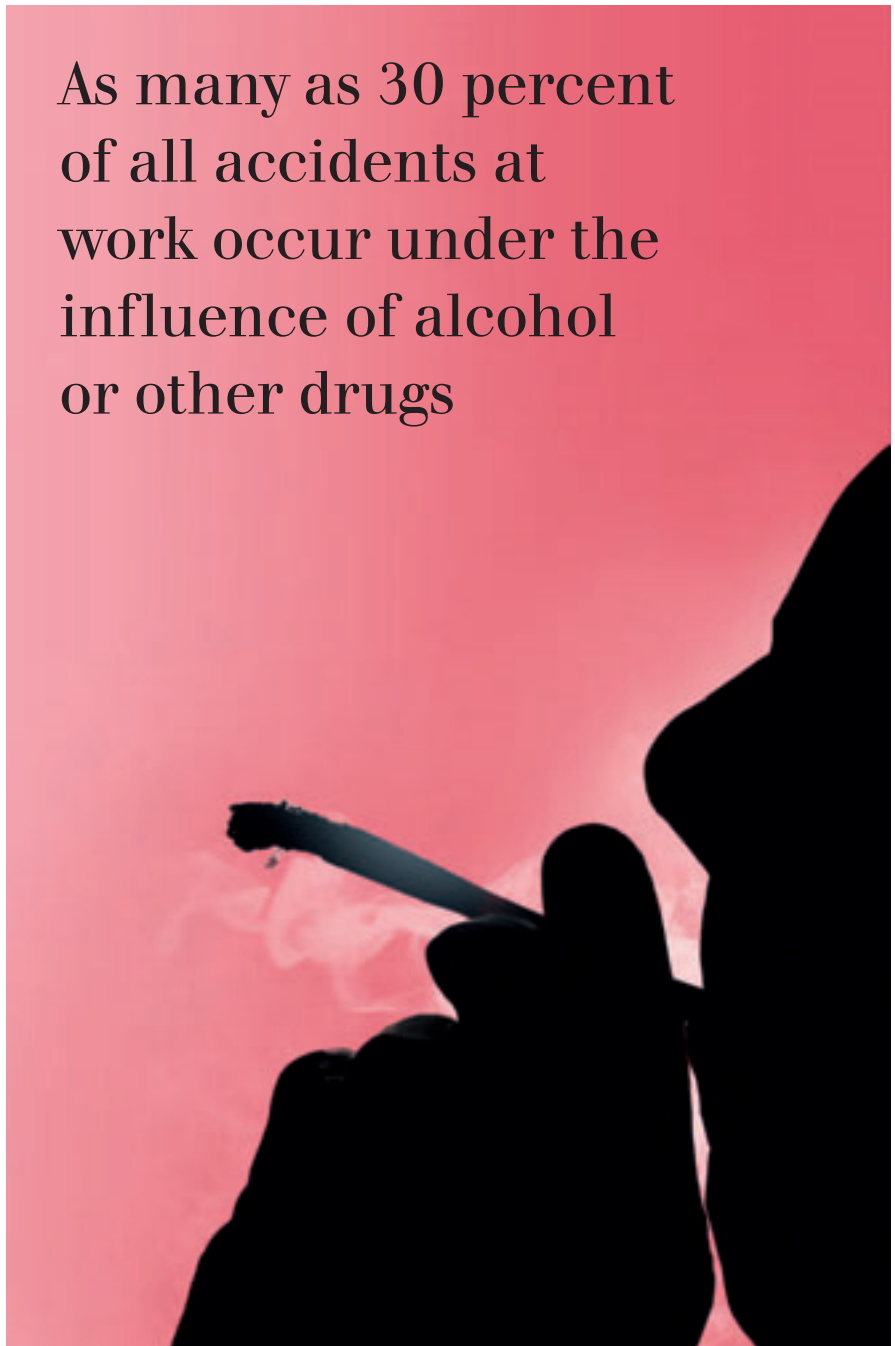


PHOTO: CHRIS JACKSON / GETTY IMAGES

“Germany is doing well in comparison”

Are corporate strategies for preventing addiction at work sensible and effective? The German Center for Addiction Issues (DHS) investigated this question as a national partner of the European project European Workplace and Alcohol (EWA) running until mid-2013.

CHRISTINA RUMMEL of DHS speaks about the first interim results.

The EWA project examines corporate addiction prevention in Europe. How does Germany shape up?

Germany does well in comparison with other European countries. There are numerous established activities aimed at recognizing the risks of addiction at work and preventing it. Germany also has one of the best addiction help systems: a well-developed network of counselors, a good rehabilitation network, and plenty of research into addictions. Preventing addiction at work has been a live topic here for 30 years, while other countries are only now discovering it. But it still is not the end of the story for us.

What do you think still needs to be done?

Small and medium sized businesses have a lot to do. Addiction prevention now takes place in all large companies, where there are works councils, occupational physicians, and established structures. The owners of small businesses and management level workers in medium sized companies are usually plagued with very different worries. There they have hardly any capacity for addiction help programs available.

How can the EWA project help companies?

At the moment we are trying to learn from one another and evaluate our national activities. After we conducted surveys in Germany, several things are going: from flyers to trainings. We will then conduct further surveys to see how much perception has changed. At the end, the results of all the European partners will be brought together and a “tool kit” will be created, even small companies will be able to work with it.

Are national differences taken into consideration?

Yes, the tool kit will be adapted to the particular conditions in each country, since there are of course cultural differences in the way people deal with drugs and alcohol. But we are making sure that we learn from one another. The United Kingdom, for instance, is very progressive when it comes to the use of new media. Self-testing using apps and visiting advice centers are things which occur much more naturally there. These are good suggestions.

among employees is common practice in certain professions. In Germany on the other hand, this is legally impossible: drug and alcohol tests may only be insisted upon before employment commences, but not afterwards.

Many companies now rely on employment agreements incorporating addiction prevention measures. These include guidelines for anybody confronted with alcohol or drug abuse, and create a clear legal situation.

Fritz Lehmann, Ludwig Eickemeyer, and Sabine Morati can no longer imagine how they managed to work at all: strung out, brought up to the bearable limit, cold and sweaty, because their bodies lacked substances. Following their treatment they were different people, but they were allowed to stay in their jobs. None of them have relapsed. “The realization of who I am and what I am really doing here is too great,” says Eickemeyer. So too was the shock of contemplating the circumstances in which he had worked all those years. Shock enough indeed to say no to a beer at the next office party – and the one after that – and to earn the admiration of his colleagues. **Isabell Spilker**

Links

- ▶ “Management of alcohol- and drug-related issues in the workplace”, International Labor Organization, www.ilo.org
- ▶ “Alcohol, Work and Productivity”, European Commission, http://ec.europa.eu/health/alcohol/docs/science_02_en.pdf
- ▶ European Workplace and Alcohol: www.eurocare.org/eu_projects/ewa
- ▶ Maximising employees performance by minimising the impact of substance in the workplace (Mepmis): <http://www.alcoholdrugsandwork.eu/>

How Therapy Can Help

One of the key mottos among **RECOVERING ADDICTS** goes: “There is no shame to be sick. It is a shame, to do nothing about it.” To recognize and understand the dependency is the purpose of addiction treatment – even 20 years after the last beer or the last joint. This is a complex theme approached from many sides in our expert interview, patient report, and stages of therapy.



Addiction is like a cage. It prevents personalities from unfolding. Proven concepts help find a way out of the prison

Therapy's goal is that the person understands why he is sick

"Only those who understand their addiction, have a chance at a life of abstinence. This is the experience of Heinz-Peter Röhr. The addiction therapist who has worked for over 30 years in the German Speciality Hospital Fredeburg – and has already helped hundreds of people

Mr Röhr, what kind of people come to you?

The image of the addict is changing. At the moment we have many patients who use multiple drugs. Straightforward alcoholics are becoming rarer. Many take cannabis, cocaine, amphetamines, and designer-drugs as well as drinking. The classic heroin addict is also less and less commonplace, although that does not make the addiction any less dangerous. So-called 'soft drugs' such as cannabis should not be seen that way. People suffer immensely under the personality-changes that these drugs cause.

But a drug like heroin is much more destructive to people than a combination of alcohol and cannabis, isn't it?

This may seem so, in reality, the curve spirals straight down. What seems harmless at the outset brings people to a low-point. When the pressure builds up, they come to us.

The pressure from outside?

Admittedly, almost nobody comes to us voluntarily. It is more likely to be their employers no longer putting up with it, their families going on strike, or their bodies giving up. When physical impairment sets in, patients realize that if they don't do something now, the end may be near.

That doesn't sound like realizing you're addicted. Are those promising reasons to be entering therapy?

Realization and the motivation to live in abstinence often develop only once in the therapeutic community. In fact it does not matter whether or not a patient really wants to go at first. This is the goal of

therapy: that is for the patient to become aware of his or her illness, to become motivated to abstain, and to begin to understand the background to why he or she has become an addiction sufferer in the first place.

Do you research the causes then?

We do try to recognize and understand backgrounds. Sufferers have to realize that they are actually dependent on something else, perhaps on an unresolved parental relationship or on other people – and that they suffer from a lack of self-esteem.

How long does it take to come to this realization?

That can vary a lot and depends on how they take to therapy and how quickly they begin to process their problems.

What might a reason be for giving up therapy?

A relapse for example, although that in itself does not have to mean immediate discharge; rather it can be pointed out, understood, and processed within therapy.

Do different types of narcotic dependencies give you conclusions about the people or give you instructions for their therapy?

Yes, for sure. People with narcissistic disorders tend towards cocaine, because it has precisely the effect they are looking for: it accentuates their delusions of

grandeur. Borderline patients prefer sedative substances: alcohol, heroin, tranquilizers. But addiction is a very individual problem.

How do you prepare your patients against not relapsing again afterwards?

We take the different situations of consumption under the magnifying glass. The patients get shown how to react in those moments with different behavior patterns. Most have left the clinic with a new sense of self and a certain understanding of their disease. Statistically most relapses happen in the first three months. That is why we nearly always add aftercare, which takes place in forums such as group discussions or other therapeutic activities.

Literature

► Katherine van Wormer, Diane Rae Davis: *Addiction Treatment: A Strengths Perspective (Substance Abuse Counseling)*, Brooks Cole



Heinz-Peter Röhr is a member of a multi-professional therapist team who treat addicts



“My excessiveness saved my life”

Maren S. drank half of her life, but did not want to admit how big her problem was. Not even in therapy. In her account of her personal struggle against addiction she reveals what finally opened her eyes.

For thirty years I drank, and during that time I almost burned down my apartment three times. While drunk I drove my automobile head-on into a wall, fell down a staircase head-over-heels, fell off a high ladder in a bathroom – tearing the washbasin from its anchors on the way down. But woe betide anyone who addressed the subject of my drinking problem: I didn’t have a problem.

At work, nobody ever noticed anything wrong. I was a personnel officer at a large company, and never drank before work. During the day, I often felt bad, I was shaking, and had sweats. But I had diabetes anyway, so I was able to blame everything on that. Eventually, I was approached by my doctor. He wanted to send me to the hospital for alcohol detoxification, so that I would be clean again. I agreed grudgingly, took a few days off, and went to the psy-

chiatric clinic for ten days. Afterwards I felt so great that on the way home I bought myself a bottle of liquor. At the hospital, a social worker from the Alcohol and Drug Counseling had contacted me. She advised me to take up outpatient therapy and one-on-one therapy. I did both – and kept on drinking.

Flabbergasted Boss

The social worker set up inpatient therapy for me for a period of 16 weeks. I had to tell my employer, who was absolutely flabbergasted. I entered therapy. The problem was that I was doing it only for my boss, my therapist, my family, and my friends – but not for me. After ten weeks I left: during a weekend at home I had gotten drunk – which meant the end of the therapy.

Once I had washed down my frustration back home, I got back in touch with my employer two days later, who

saw that I had broken off therapy and did not allow me to work. I now had nothing else to do with my time. I drank almost daily to the point of unconsciousness. It was this excessiveness which in the end saved my life. I reached an absolute low-point and wanted to put an end to my life. I had already chosen the tree. I just wanted to attend one more session with my therapist. She immediately saw that something was wrong with me and did something she had never done before with any of her clients: she admitted to being a recovering alcoholic herself, and told me she knew exactly how bad it was going for me.

“I Wanted to Do Something for Myself”

That for me was the turning-point. Here was somebody who understood me, who explained to me that alcoholism was an illness – an illness which does not heal, but which can be brought to a standstill – but only by me. At last I was able to admit that I was an alcoholic. Because I was now committed to doing something for myself, I was able to do the remaining six weeks of inpatient therapy.

Then I attended another outpatient therapy, and since then I have been attending Alcoholics Anonymous every week, a self-help group, without whom I would certainly not keep my sobriety. I can’t say for sure that I won’t be drinking again next week or next year. But I can speak for today: and today I am not going to drink. I have been saying that now for 14 years.”

Report: Isabell Spilker

Therapy: four steps to success

The goal of addiction therapy is for a patient to remain abstinent permanently. Achieving this state – which is always vulnerable – requires insight, professional help, and discipline.

Step 1:

Recognize the problem and seek help

The family physician is usually the first point of contact, or an outpatient clinic. What is important at the beginning is to recognize the problem of dependency as such, otherwise all of the subsequent steps may prove fruitless. Patients must recognize the extent of their addiction, and personal circumstances must be clarified, before treatment can begin.

Step 2:

Physical Withdrawal

Outpatient: Patient's withdrawal is usually done under the supervision of a family physician. During the first week the doctor will perform daily medical checks on the health of the patient, assisting where necessary helping with medication to elevate withdrawal symptoms such as shaking, sweating, and circulatory problems. In the second week the patient visits the doctor every two days. During this period the addiction sufferer is given an incapacity to work certificate.

Inpatient: In particular for cases of severe physical dependency, inpatient treatment is indicated for physical withdrawal. Detoxification is offered at internistic hospital stations or at specialty hospitals where specially trained staff supervise withdrawal and offer accompanying discussion therapy.

Step 3:

Rehabilitation – The Actual Therapy

Outpatient: The ambulatory care takes between 12 and 18 months and involves

attending therapeutic group and individual counseling, once or twice a week. This demands that the relationship with the therapist is good and based on mutual trust, otherwise treatment is unlikely to be successful. The advantage of outpatient therapy is that sufferers can remain in their accustomed environments and with their families, and even go to work. However, there can be drawbacks since the daily routine will usually be the same as before detoxification, and some people tend to relapse in familiar surroundings.

Inpatient: Specialty hospitals offer inpatient treatments away from everyday environments for between 6 and 16 weeks, usually divided up into groups of

different addiction types and patient categories. One-on-one and group discussions investigate the causes of addiction, so that certain patterns can be recognized and treated specifically. Over the course of the remaining therapeutic treatment (relaxation techniques, creativity training, activities for leisure planning, and so on) an attempt is made to make it easier for patients to start a life free of intoxication and substances. Contact with family and friends is usually limited at first, but increased towards the end of therapy, at which point attention is paid to the patient's working and social environment.

Step 4:

Aftercare

Conversational Therapy: The basis for a life of abstinence has been created, but the risk of relapse still remains. Regular conversational sessions with a physician, at an advisory center, or with an outpatient psychotherapist can help a patient to stay on track.

Self-Help Groups: Whether it's Alcoholics Anonymous, or workers' welfare associations, self-help groups have over time become one of the strongest pillars in the battle against addiction. This is where recovering addicts and their relatives can meet people who have lived through similar things and come out on the other side.

Links

- ▶ National Institute of Drug Abuse: *Principles of Drug Addiction Treatment: A Research-Based Guide*, www.drugabuse.gov (USA)
- ▶ An overview of self-help groups in the US: www.mentalhelp.net
- ▶ An overview of Australian self-help groups: www.coshg.org.au/grouplinks.html

Glass by Glass

The acute effects of alcohol are varied and depend on many factors – but for the sake of simplicity they can be grouped into different blood alcohol levels.



0.2‰

Talkativeness rises, inhibitions leave, the response time is increased.



How Little is Enough?

Ever since they existed they have been controversial: **ALCOHOL LIMITS FOR DRIVERS**. Complete sobriety is the ideal state when it comes to performance at the wheel. In reality more liberal, graduated limits have proven effective. But what is the thinking behind limits like 0.3, 0.5, and 0.8 per mille?

Alcohol blurs
reality – especially
at high speed

0.5‰

The sensation of pain is damped, visual performance and hearing decreased. Miscalculation of speeds.



0.8‰

First balance problems occur, also the sense of sight is impaired, the response time is extended from 30 to 50 times.

The two visitors epitomize the cliché of the veteran couple: married for decades, they have been through everything together. They are accustomed to noticing each other's weaknesses and idiosyncrasies. He, focused and self-assured, is at the wheel of the Alcohol Driving Simulator, at the Hamburg Police. She watches the increasingly unsteady journey with good-natured mockery.

The problem is that the artificial automobile is making things more and more difficult for the driver as his computer-simulated level of drunkenness rises. It narrows down his field of vision and makes the steering spongy and imprecise. It extends braking distances and increases reaction times. Deer jump out of the bushes, vehicles cross his path without warning, children stumble onto the road. And then, after three or four virtual drinks, the man is unable to stop in time. "You see?" blurts out the woman. "How many times have I told you already?"

Making Dangers Clear

For police officers this is the moment to raise his eyebrows knowingly. They know it from the street, the mixture of self-assurance and false confidence. This type of driver often draws attention at checkpoints: the one who is sure he has everything under control. But at just 0.5 to 0.9‰ Blood Alcohol Content (BAC), the risk of dying in an accident is between 11 and 13 times greater, even if only one vehicle is involved. This rises to a factor of 50 between 1.0 and 1.4‰. Above 1.5‰, the danger is almost 400 times greater.

The thing to do, says Michael Wenzien, is to help people see the danger they are suppressing. He is a police officer, at Station 620 in Hamburg, responsible for prevention. The simulator stops as many as 200 times a year in vocational colleges, trade fairs, and shopping malls. As in real life it sorts people into categories which the officer knows all too well from the highways: "For those who over-estimate themselves, we get them to drive on a country road where 70 km/h is allowed. By the time they exit the third corner they're clocking 90. Similarly conspicuous are the over-cautious who know they should not be driving, but do it anyway. Those are the ones we see at night, creeping along a multi-lane road at 40 km/h." Both drivers know they are doing something forbidden – it excites one of them and frightens the other. But neither has the sense not to drive.

That is why, to add to preventative arguments, checkpoints are set up as deterrents. And if somebody exceeds alcohol limits they are punished. This is necessary, since it is also the state's responsibility to protect the rights of others. A typical case: Kirchweyhe near Bremen, Germany, in April 2010. A car crashes, after midnight in a Tempo-30-Zone, against a tree. The speedometer hangs at 130 km/h, impact speed is later ascertained as 107 km/h. The rescue services find six young people inside, three of them dead; the driver dies later in intensive care. His blood alcohol level is measured at 1.4‰.

"Zero alcohol at the wheel" is what the German Road Safety Council is call-

ing for, an umbrella organization representing more than 200 entities including all of the German Transportation Ministries, accident insurance companies, automotive manufacturers, and driving clubs. "Zero Limit", which in the history of German driving was a strategy adopted solely by the former GDR, was abolished there on January 1, 1993, whereafter a limit of 0.8‰ applied until April 1, 2001 when the general German limit of 0.5‰ was brought in. The exception is for new drivers in their probation periods, and drivers under 21: since August 1, 2007 they have been obliged to remain completely sober, as are bus and taxi drivers and operators of hazardous material vehicles. An all-out ban is very unlikely. In the end, the philosophy of Western societies puts trust in the reason and judgment of the individual. The balance between the wishes of the driver's freedom and the rights of others. Underlying this is the "Recht" conception of Konigsberg's Enlightenment Philosopher, Immanuel Kant: "*Recht* (legal justice) is the embodiment of all those conditions under which one person's arbitrary judgment can be reconciled with another's according to a general law of freedom." That is why there are limits – or in other words, 'compromises in numbers'.

Deterrence as a Goal

The German rule is 0.5 per mille and was created in 1973 and reinforced 2001 with § 24a of the Road Traffic Act. The thinking behind this is general deterrence. Does it work? "The number of accidents under the influence of alcohol and other intox- >



1.0 ‰

A bidding frenzy begins. Emotions and behavior are clearly altered.



2.0 ‰

Alcohol acts partially as a strong sleeping pills, speech is clearly slurring. Memory problems occur, as well as blurred vision. Muscles go limp, the pupils are small.

> icants fell by almost 40 percent between 2001 and 2011. And that, although there had neither been a tightening of the law nor a significant increase in the traffic control since 2001,” stated Dr. Beate Merk, Bavaria’s Justice Minister, after after a good decade of “Zero comma five”.

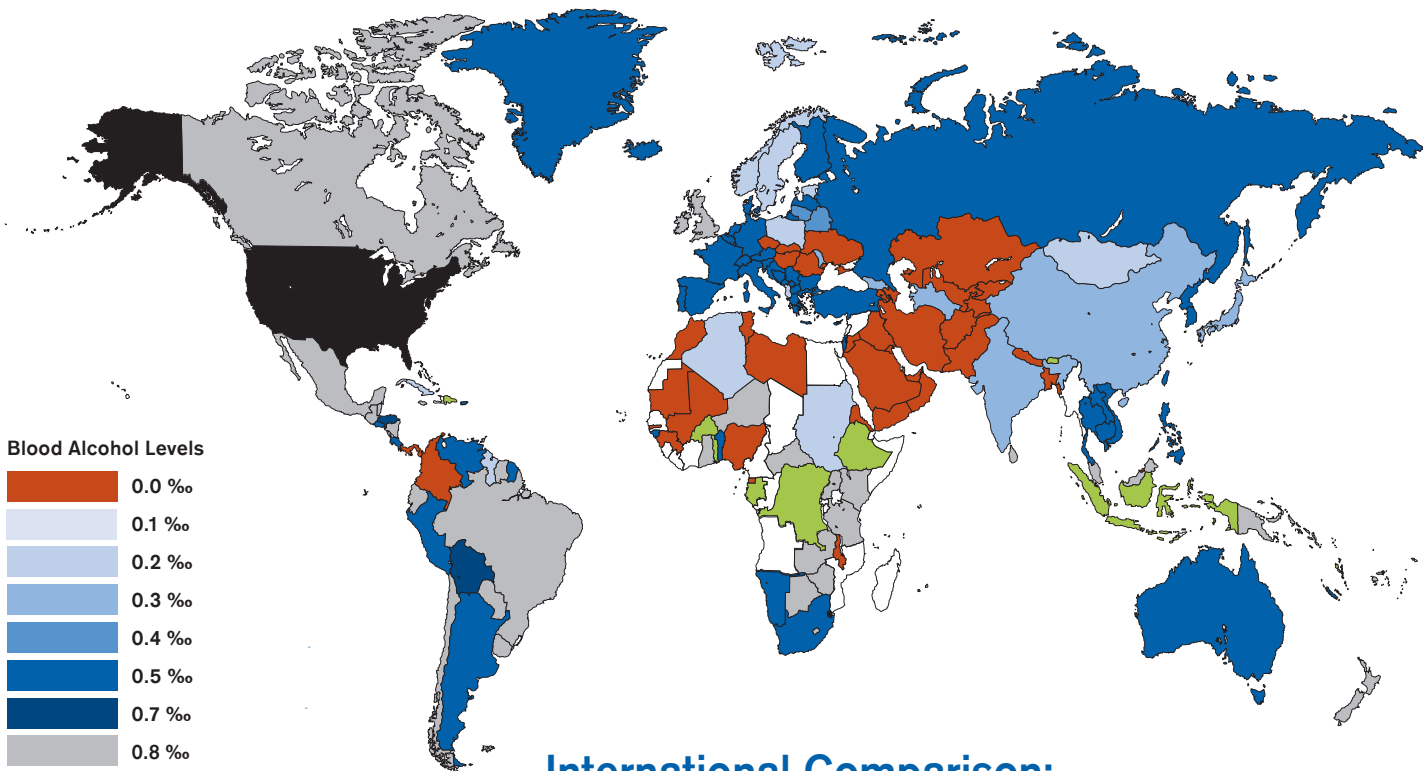
Blood Alcohol Levels Crumble

The actual application of the law and its limits becomes more complex, and is justified very differently, whenever a

drunk driver attracts attention by making mistakes, or causing an accident. This is clearly not every driver. This is when § 316 of the German Criminal Code comes in. Established in 1953, it is 20 years older than the general blood alcohol limit. Anybody who “drives a vehicle despite being unable to control it safely on account of having consumed alcoholic beverages or other intoxicating substances” faces up to 12 months in jail. But § 316 does not name any figures.

Those are left to the judges, and the highest courts of the land have continuously adjusted them in line with new research findings. The philosophy behind these limits differentiates between an “absolute” and a “relative” inability to drive.

An absolute inability to drive means the point beyond which scientists have shown that nobody is able to drive safely. In 1953 the Federal Supreme Court of Germany interpreted current research to mean that this was at 1.5 ‰. In 1966,



International Comparison:

Although the physiological effects of alcohol are the same all over the world, different countries allow different blood alcohol levels on their highways – from 0.0 to 1.0 ‰. This map is a snapshot from the beginning of 2013.



2.5 ‰

The effect now crosses over into a form of anesthesia: pupils dilate, all aforementioned disorders are amplified. The drinker may

now fall unconscious suddenly and go into shock. If he continues to drink then coma and death threaten – by circulatory failure, suppression of the breathing reflex, or hypothermia because the body's temperature has been sinking steadily.

following a report issued by what was then the German Federal Health Office, this figure was cut to 1.3 ‰. Physicians had stated that not one test person was able to fulfill the demands of driving at a BAC of 1.1 ‰ or above. To give defendants the benefit of the doubt the Court added a safety margin of 0.2 ‰. Then in 1990, the “absolute zone” was defined as 1.1 ‰ and upwards: anyone accused under § 316 of the German Criminal Code is not permitted to present personal counterevidence if a reading of 1.1 ‰ or above has been proven. Even if the person was able to drive perfectly, it is immaterial. They are sentenced.

Relative inability to drive, in which drunkenness appears together with alcohol-related malfunctions, is another matter. An example of this is a driver who is unable to drive a straight line. The requirements of evidence are strict, but the flipside is that it matters not whether somebody's proven blood alcohol level is below 0.5 ‰: after an accident, severe penalties can be imposed, even at levels of 0.3 ‰ and above. All of these limits serve only one purpose – to decide for or against conviction – they are known as “evidence limits”. And because they are of critical significance, there are strict regulations around how they are measured.

The “blow” on the roadside is the clarification of the first suspicion. A decisive role is the court of law breath sample with extremely reliable analysis - in Germany they are only permitted with the Dräger Alcotest 7110 Evidential - or a blood sample, which is insisted



Sobering: using a driving simulator you can get an idea of how the roads can appear at different levels of intoxication

on for levels 1.1 ‰ and upward. When it comes to taking samples it is crucial to adhere fastidiously to procedure. For instance: samples have to be taken by a doctor, and if the doctor wants to hand over that responsibility – to a nurse for example – then this can only be done with the suspect's consent. Procedural mistakes are therefore a risk, and a resourceful attorney may well use them to fight for acquittal.

Changing Mentalities

The Koblenz Administrative Appeals Court issued a verdict in 2010 which illustrated clearly the different approaches taken in different areas of law. A license suspension during the administrative procedure serves as a precautionary protection avoiding dangers to other road users demonstrated by inappropriate drivers. In criminal proceedings, however, later

criminal wrong doing will be punished. If you connect with this view, the question remains: Is it “criminal injustice“ when a driver is at 0.1 ‰ on the road and safely arrives at their destination? Specifically, if they do not harm anyone, but the law says “yes”, the danger presented to them from this is as equal as if someone improperly handle explosives in a pedestrian zone.

A survey conducted for Dekra in 2012 showed that Germans think an absolute zero limit would not be a bad thing; 78 percent of those asked are in favor. Many experts also believe it would be sensible, well justified, and one day absolutely possible to realize – thanks to a general change in mentality. It used to seem fine to brag that you had not been caught: ‘Imagine it – dead drunk, but they didn't even catch me!’ Say that today and almost everyone will shake their head: ‘What kind of a person are you?’”

Silke Umbach

Simple Yet Convincing

The principle behind the **BREATH ALCOHOL IGNITION INTERLOCK** is remarkably simple. It does not release a vehicle's starter motor until it has accepted a breath test.



Preventing drunk driving: the Interlock XT is an intelligent ignition key which prevents people from driving under the influence of alcohol

Incorruptible: the Dräger Interlock XT is protected against tampering; the measuring system inside accurately detects alcohol



Interlock XT: First blow, then drive.
The principle behind the breath alcohol controlled immobilizer
www.draeger.com/107/interlock

Taking a breath test to start your automobile? To many this may sound strange, but in some places it is already a reality: the driver blows hard into the mouthpiece of a discreet hand-held device which analyses the alcohol content in the exhaled air. If the result is negative, then – a few seconds later – the interlock releases the starter motor. This form of immobilizer, known as an “alcohol inter lock”, is not there to protect against theft, but to reduce the risk of people driving under the influence of alcohol. The latest devices feature electrochemical sensors – including Interlock XT, which measures specific amounts of alcohol.

Alcohol interlocks represent a paradigm-change in the way road safety is monitored, since the tests they perform are done preventatively – before you start your engine. Conventional roadside checks are done at random and aim to identify alcohol offenders who are driving on the highway, and punish their behavior as a petty or criminal offense.

USA: Pioneering Introduction

The USA (where there are now more than 200,000 such devices in use) and Canada pioneered the introduction of breath alcohol controlled immobilizers in the 1980s. They are also widely used in Australia, and in Europe: the first European schemes were in Sweden (regionally at first, beginning in 1999, nationwide since 2004), France (initial study in 2004), and Finland (since 2008, program established as law in

2011). Positive results obtained in field tests have encouraged lawmakers in various European countries to push forward the introduction of alcohol interlocks. By the year 2015 for example, every new school bus in France will have to be equipped with an alcohol interlock. In Sweden this is already mandatory for any transport commission put out for tender by the state.

The principle of the alcohol interlock is as simple as it is convincing: if you are drunk, then you cannot start your vehicle. Although it may seem like a good idea to equip every single vehicle with such an immobilizer right away, blanket installation would be almost impossible from a legal and economic point of view. Nevertheless there are enough examples showing that the system works well and is accepted. These include passenger transport (buses, taxis) as well as goods transport (e.g. hazardous materials). In both cases, drivers carry a heavy responsibility towards passengers, the general public, and the environment. Then there is the use of such immobilizers to encourage people who have already been found drunk-driving to learn strict separation between drinking and driving. In the Netherlands, a law having been passed to that effect at the end of 2011, states more than 1,000 automobile drivers now have such devices fitted in their vehicles (see also Dräger Review 106; pages 44–47).

But the technology can only be effective if it works reliably and can withstand manipulation. The Dräger Interlock XT incorporates various

mechanisms to ensure that breath alcohol content is analyzed accurately, and tamper attempts are detected reliably. Once a breath sample has been provided and accepted, it passes through the sampling bellows onto an electrochemical sensor. If the result is negative then the device sends a signal to the vehicle’s electronics to release the starter motor.

More Safety

When these devices are installed in passenger and freight vehicles it is referred to as ‘primary prevention’. The driver is not under any actual suspicion. “Using an alcohol interlock meets the need for safety of passengers and the environment,” says Bettina Velten, Product Manager at Dräger. “This builds trust and highlights the responsibility taken by drivers and operators.”

But installing the devices in vehicles belonging to drivers with previous records is a different matter. This ‘secondary prevention’ serves to prevent any more drunken road use, and is prescribed instead of, or after a ban on driving. The direct effectiveness of alcohol interlocks has been confirmed in scientific publications such as the Meta-Study published in 2011 by the US-American Guide to Community Preventive Services, and the Cochrane Study in 2009. A study entitled “Alcolock Implementation in the European Union” presented in 2006 and sponsored by the European Commission underscores the suitability of this technology for a range of purposes. Bus and truck drivers were involved in the project as test >



Alcohol-Interlock
in freight transport



Dräger DrugTest 5000
used for industrial safety

Alcohol interlocks are a major element in primary prevention in the

- > groups for primary prevention. Drivers with existing records of driving while drunk formed further test groups for the secondary prevention area.

Putting a Stop

Alcohol interlocks have proven an effective method of preventing convicted alcohol offenders from driving while drunk again – this especially when compared against taking away driver’s licenses, since people’s willingness to get behind the wheel when they shouldn’t obviously grow under the influence of alcohol, even if their driving permit has been withdrawn. A breath alcohol controlled immobilizer puts a technical stop to this kind of drunk driving. But it leads some of those involved to try to circumvent the devices. That is why reliability and protection against tampering are so important. Devices which, like the

Dräger Interlock XT, comply with the European standard EN 50436, fulfill all of the conditions governing testing procedures and operating behavior.

Events – such as measured results from breath alcohol tests and journey durations – are all stored in the device together with dates and times, and can be retrieved by trained and access-authorized personnel using the appropriate hardware and software. This is usually done every few weeks. The user’s details are encrypted so that others cannot see them from the outside. When used as part of therapy, the results allow conclusions to be drawn about things like whether the user’s drinking behavior has changed. Studies have shown that some drivers who have committed multiple offenses return to the road drunk as soon as their devices have been uninstalled at the end of the program. That is why,

in order to extract the full potential of an interlock program, the device should be combined with accompanying activities.

Rapid Detection Methods

The first technical interlock concepts came about in the 1960s. Dr. Robert B. Voas of the National Highway Traffic Safety Administration (NHTSA) in the USA is considered a pioneer of the idea, having anticipated the function of modern interlock technology in his essay entitled “Cars that Drunks Can’t Drive”. Voas was involved in the technical ignition interlock specifications that now apply in America and which were published for the first time in 1992 (Model Specifications for Breath Alcohol Ignition Interlock Devices). Initially, experiments were done in North America using systems that attempted to ascertain the ability to drive by means of reaction-testing.



Checking breath alcohol levels underground

PHOTOS: DRÄGERWERK AG & CO. KGAA

workplace



1. When you switch on the ignition ...



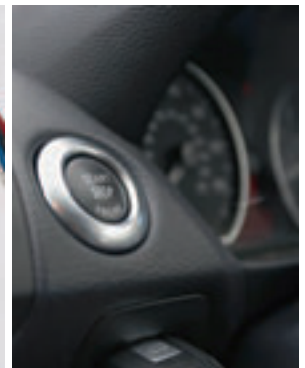
2. ... the Interlock XT asks you to give a breath sample.



3. The alcohol content in your breath is analyzed ...



4. ... and if you pass the test, the system releases the starter.



5. Now you can start the engine

But in the end, testing breath alcohol before the commencement of driving proved the quickest and most direct method of proof. This basic principle has not changed much since. With the proliferation of alcohol interlocks, the

demands on the devices and on data management have risen. "With our experience we are ready to assist those who are working to introduce drunk driving programs," points out Bettina Velten. The winners in these schemes

are the drivers, who can submit breath samples under unambiguous and reproducible conditions. Meanwhile, everybody else benefits too from the extra safety brought about by the use of alcohol interlocks. **Peter Thomas**

The Fairy-Tale of the Healthy Drug

Numerous stories surround the **EFFECTS OF ALCOHOL AND DRUGS**. They will downplay the dangers, or even re-interpret intoxicants as healthy. But upon closer inspection, most of them prove to be nothing more than bizarre fairy-tales.

No question: A glass of wine in good company can be good, even a cigarette. Carrying on a conversation is easier, the mood is relaxed. It's fun, and you're reluctant to spoil it – for example by the warnings concerning the dangers of alcohol and other drugs. It is much more comfortable there, yet the idea that alcohol in moderation is actually beneficial to your health – or that you can keep the effects of drugs in check with little tricks. But is that true?

Healthier Alcohol

Red wine drinking received the highest of scientific honors when epidemiological studies revealed that moderate alcohol consumption correlated with a low incidence of cardiovascular illness. But there are limits to this. Only moderate alcohol consumption appears to have a positive effect on the blood vessels”, explains Dr. Renate Schnabel, cardiologist at Ham-

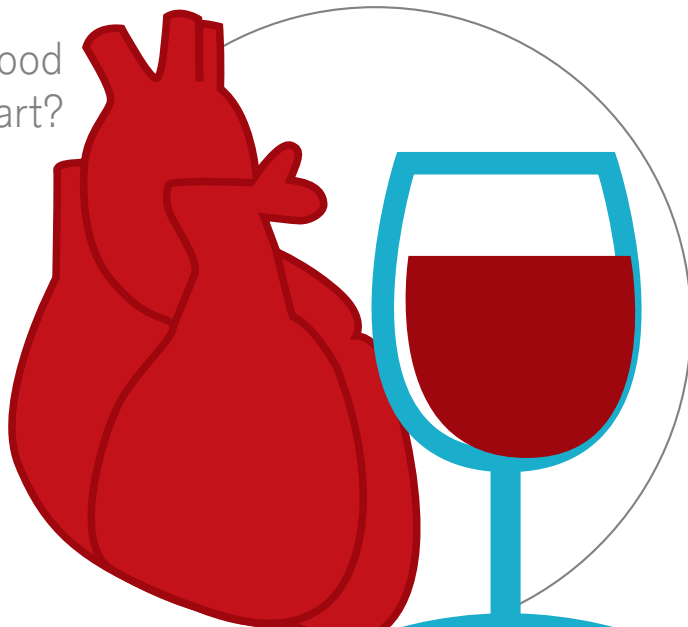
burg-Eppendorf University Hospital. “In the case of red wine, flavonoids and polyphenols like resveratrol appear to play a part, helping among other things to prevent blood platelets from sticking together, something that makes a heart attack more likely.” In this respect a glass of wine or beer can still be healthy, but higher quantities of alcohol damage the heart instead. “The name ‘Holiday Heart Syndrome’ is given to the cardiac arrhythmia and atrial fibrillation that often occurs following vacations involving a lot of drinking,” says the doctor.

That is all very well and good, but surely schnapps aids the digestion after a heavy meal? Not so, say researchers in Switzerland of late. They gave 20 people cheese fondue containing 200 grams of cheese, accompanied by bread and followed by either wine, a glass of schnapps, or just tea. The results were surprising: those who drank alcohol digested the food significantly more slowly than the

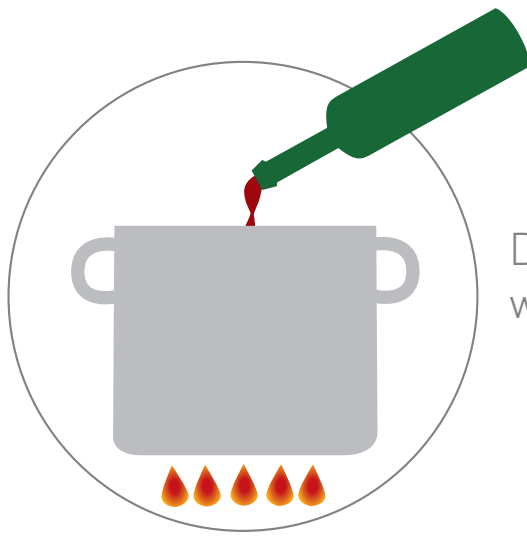
tea-drinkers. Alcohol relaxes the stomach muscles, making you feel subjectively that your fullness has been alleviated; but actual digestion is slowed down.

Nor does alcohol deliver what it promises as an aid to sleep. It does make you tired and might help you to fall asleep more easily, but the sleep you then get may not be any more rejuvenating. During the first half of the night, alcohol prevents deep sleep, making you toss and turn without dreaming and awaken frequently; your muscles slacken, and anybody else in bed with you will suffer from your snoring. More dangerous still are the brief interruptions in breathing known as sleep apnea, which alcohol can intensify. What is so unfortunate about it all is that regular drinkers will not be able to escape these sleeping difficulties simply by ceasing to drink suddenly. That leads instead to a distinct sleeplessness, which, sadly, many people deal with by drinking again.

Is red wine good for your heart?



Does alcohol help you sleep better?



Does alcohol evaporate when cooked?

Just a few drops of wine into the fish stew? No problem, it'll evaporate as it cooks. Unfortunately that too is a fallacy dispelled at every Christmas Market, where mulled wine heated for hours still has 'plenty of punch'. Alcohol does boil at 78 degrees Celsius, and evaporates when mixed with water, but only down to a concentration of five percent. At that ratio the mixture forms what is known as an 'azeotrope', which has a constant boiling point. That is why in experiments done on red wine sauce, it still contained five percent alcohol even after 2.5 hours of boiling.

Waterpipes are fashionable because people believe they offer a more beneficial way of smoking. After all, the smoke passes through water before you inhale it, and is therefore cleaned. This too is erroneous, say experts. The health dangers are underestimated on account of the sweet aroma of the smoke and its lack of bitterness and harshness. Nicotine concentrations in the

PHOTO: SHUTTERSTOCK; GRAPHICS: PICFOUR

blood are much higher after smoking a hookah than they are after cigarettes. During one sitting, consumers inhale about the same amount of smoke as they would from 100 unfiltered cigarettes – a thought-provoking fact from the World Health Organization.

Tricks for the Breathalyzer

A strong coffee, a short nap, a good jog to break a sweat – that should banish the hangover. Unfortunately this thought-process leaves out the liver. The liver is unimpressed by it all, process-

ing alcohol at a constant 0.1 to 0.2 per mille per hour. And if you happen to be driving home and encounter the police after an inebriated night, garlic on your breath or peppermint sweets in your mouth will be met with indifference by the officers. Measuring devices like the Dräger Alcotest 9510 cannot be duped. Foreign aromas do not affect the reading, and even if a lower breath-alcohol content is indicated at lower temperatures, the device adjusts that reading back up to the normal temperature.

Regina Naumann

Intoxicated from a champagne bath?

Decadent, but scientifically studied: Bathing in champagne really can increase your breath-alcohol level to over 1.5 per mille – but only up to 15 minutes after you leave the bathtub. Your blood-alcohol concentration will remain at 0.1 per mille. Alcohol does not reach the blood through the skin, and you will remain as sober as a judge even after such an extravagant bath.

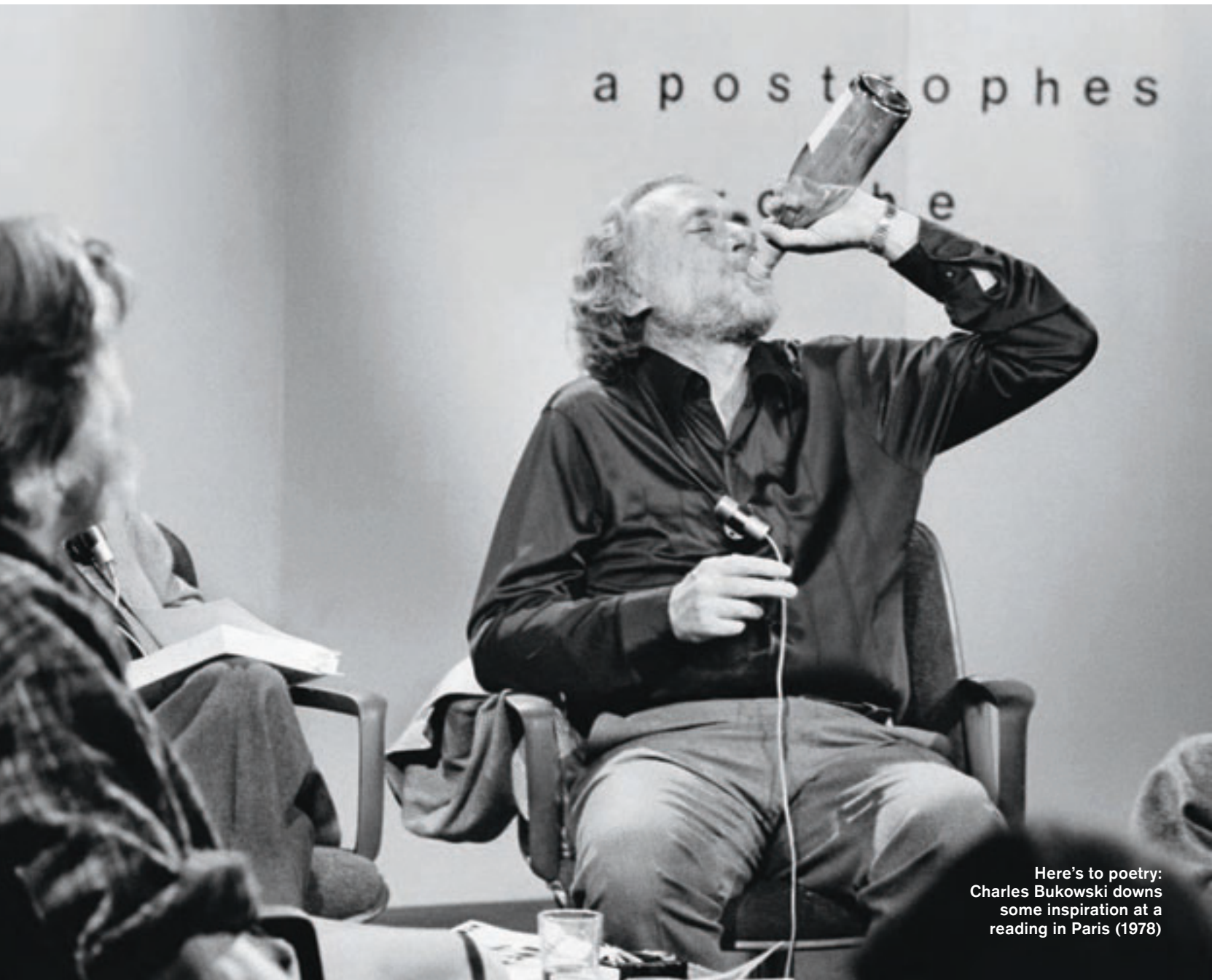
Waterpipes: healthier than cigarettes?



Is schnapps good for your digestion?

Loaded Literati

A ramble through **LITERATURE REVEALS DRINKING** in all its facets: the pleasures and pains of intoxication, the allure and destructiveness of excess – all this can be found in the literary works and biographies of recent centuries. But the emphasis has shifted.



Here's to poetry:
Charles Bukowski downs
some inspiration at a
reading in Paris (1978)

Benjamin von Stuckrad-Barre drank his last beer on the way to rehab. One last sip. One of the most famous German writers who is recovering alcoholic – for some years now, he says. After years of being permanently plastered, he took the train to the clinic – a train which would have had space for Johann Wolfgang von Goethe, E. T. A. Hoffmann, and Charles Baudelaire, as well as Edgar Allan Poe, Ernest Hemingway, and Charles Bukowski, Oscar Wilde, Jean Paul, and Jack London.

Hair Turned Green

It certainly would have been an illustrious compartment of talks and therapy. Goethe recounting his two or three bottles of wine daily and how his wife Christiane perished of alcohol while he himself drank on, undeterred in his garden-house in Weimar. Drug-crosser Baudelaire, who admitted having dyed his hair green under the influence of his favorite everyday tippie absinthe (combined with opium).

Hoffmann, who stoked his imagination by night with wine and punch. All of them would have sat cozily together and promised to say no next time anybody offered them a glass of something strong; and each one of them would have probably lived for twenty or thirty more years – apart from Goethe, who, incredibly, survived to the ripe old age of 82 despite more than 60 years of alcohol abuse. Hoffmann would not have died of cirrhosis of the liver at the age of 46, and Wilde would not have had to >



“Hardly a crime novel can be consumed without alcohol”

MICHAEL KRÜGER is a German publisher and author. With the scientific satire “Literature & Alcohol”, he wrote a not entirely seriously intended directory real existing and possible drunken literature.

Mr. Krüger, as an author and publisher you can surely answer this: Does alcohol produce better writing?

Better no, but it may be easier. Historically there have been authors who have only been able to write under the influence of alcohol. This was already heard of in ancient times, when they believed the gods would moisten the tongue and speak through the author. In our society today things have changed now that alcohol is considered a drug and an intoxicant.

As a publisher, do you notice by a manuscript whether or not an author has been drinking?

No. Alcohol may moisten the tongue, but I can't see that in a manuscript. Maybe it would not have reached me without alcohol, but as a reader I cannot possibly know that.

Literati and alcohol somehow belong together. Could it be that drinking is simply noticed more among authors?

For sure. I would not say that there is any more drinking in literary circles than in other professions. Young people especially drink enormous amounts nowadays, and they certainly are no poets.

But there must be something to explain this connection between alcoholism and creativity?

There is no doubt that alcohol is a theme among authors, since it is one of the ways of assuaging fear of failure. A freelance author's profession is not an easy one, and it is beset by fears. You keep asking yourself: is what I have written good enough? Alcohol can free you of this fear.

To many, a glass of red wine goes with a book. Does wine free up your imagination and allow you to immerse yourself in a story?

The question is, why do you read? If you read in the evening to relax, then it may not be a bad thing. Almost every crime novel – to take that genre as an example – is so bad you can only digest it with alcohol. The next day you will have forgotten what you read anyway, which is not such a terrible thing. As a publisher there is no way I could drink while reading, since it would obscure my view of things. For me, reading is work, and that can only be done while sober.

“I hate to advocate drugs, alcohol, violence, or insanity to anyone, but they’ve always worked for me.”

Hunter S. Thompson

> say to his final visitor, just before dying at the same age: “My wallpaper and I are fighting a duel to the death. One or the other of us has to go!” Jack London would probably not have taken his own life at the age of 40, while Hemingway might have undergone therapy for his depression and not shot himself in his late sixties (see also pages 22–23). But would their writings in their years of abstinence have delighted us like those of the time of drinking?

One thinks of the great writers, the image of the drinker is not far away. Whether one, two, three glasses to relax the pen, or smoking-experiments to expand the consciousness: alcohol, drugs, and literature seem curiously intertwined. Not only because many authors have positioned since

ancient times their vices in letters or anecdotes, poems – without it at once to be described as such, or the necessity to feel. On top of that, the picture of the tipling author, seen in retrospect, is never really a bad one. Alcohol and drug abuse adhere somehow less negatively to dead poets than to those alive today, who are generally considered dissolute, immoderate, and not to be taken seriously.

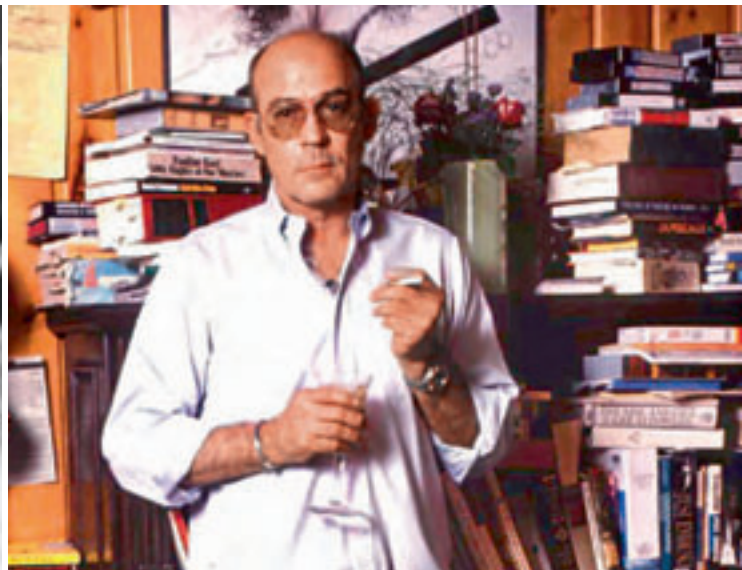
Title Allure

It is not difficult to accept Günter Grass with a glass of wine in his hand. Nor Michel Houellebecq either, even if he never seems to tire of claiming that sex is the better drug. Authors like Christian Kracht and Benjamin von Stuckrad-Barre realized what alcohol did to them.

Years ago they made booze their trademark, accompanied by wild, alcoholic excesses and pop literature in the same breath – and doing it now as their trademark, to have overcome that.

The American Augusten Burroughs chronicled his own rehabilitation in a book, while Joachim Lottmann uses alcohol as a title to lure readers, while in the book he assures us constantly that he himself has never enjoyed drinking it. The image of the modern drinker has changed, for readers and authors alike. People seem to have grown tired of feeling that every book has to be drawn from the bottom of some barrel. Whether the consumption of alcohol is now hidden better or abstinence is actually lived, remains the secret of the authors.

Isabell Spilker



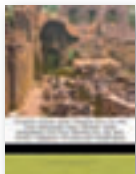
The Old Man And The Sea (of Booze!): Ernest Hemingway in Pamplona (1959). Right: Hunter S. Thompson who while drunk invented a new kind of reporting, then went on to baptize his dissolute writings as ‘Gonzo Journalism’ using drugs of all kinds

Top Works of Intoxication

Despite or because of alcohol: these works would not have existed as we know them had it not been for intoxication before, during, or afterwards – and it is a short list which would be easy to expand, and with more than just Ringelnatz's *Kuttel Daddeldu*.



Johann Wolfgang von Goethe (1749–1832): Dr. Faustus Where else would Mephistopheles have led Faustus to show him the 'easy life' other than in Auerbach's Cellar, where wine flowed unabated? Goethe hung out and enjoyed his first glasses of wine there as a student.



Jean Paul (1763–1825): Siebenkäs, Hesperus Jean Paul, a contemporary of Goethe, used to enjoy his wine, liquor, and beer, nor did work stop him doing so. Would his writing have been better without? Maybe it would not have existed at all, since "drunkenness increases two things: courage and love," he claimed.



Edgar Allan Poe (1809–1849): The Raven Although he would get legless on just a glass of wine, the tormented author Poe never escaped the clutches of alcohol. Countless later writers based themselves on Poe – without him we would not have had many of the great works we enjoy today.



Charles Baudelaire (1821–1867): The Flowers of Evil Baudelaire's magnum opus is due to absinthe. It made him France's greatest lyricist; they say that only the madness of absinthe could elicit such genius.



Jack London (1876–1916): John Barleycorn: Alcoholic Memoirs Classic of hard liquor: what his autobiographical novel about alcohol addiction naturally cannot tell us is that in the end the author committed suicide under the influence of drugs.

Gottfried Benn (1886–1956): Bierode A homage to the brown brew, the Benn had fallen in every respect. Not without irony, the poet and doctor Gottfried Benn dedicated here once more his great vice.



Ernest Hemingway (1899–1961): The Old Man and the Sea The Pulitzer and Nobel prize-winning work was set and written in Hemingway's adoptive home of Cuba, where he daily drank several dark-green daiquiris, mojitos, and downed wine, whiskey, and tequila by the bottle.



Malcolm Lowry (1909–1957): Under the Volcano Lowry's most successful work, to a degree autobiographical, which revolves around the fate of a drinker: in the final stages of alcoholism the protagonist finds himself on a journey through Hell, which at the same time is Paradise.



Charles Bukowski (1920–1994): Post Office None of his works would be the way we know and love them today without alcohol. Only someone familiar with the highs and lows of drunkenness and who has experienced the destruction of his own body, like binge drinker Bukowski, can describe such things so convincingly.



Hunter S. Thompson (1937–2005): The Rum Diary This book is about alcohol and it was written in alcohol. The enfant terrible of the 'Gonzo Journalism', Thompson erected a monument to himself with this eccentric work.

The Drunk Shift

Especially on weekends, it is for some **PARTY-GOERS** their final destination: the Emergency Room. Those who end up here have ingested so much alcohol or other drugs that they are no longer in control of themselves. Underlying this: more and more young people are being treated for alcohol poisoning.

A beeping sound – like a digital alarm clock that nobody turns off. To outsiders it may be irritating, but it is the sound which the nurse Judith Szücs has been listening to for the past five years. She is 26 years of age and works at the Central Emergency Room at German Hamburg-Eppendorf University Hospital (EUH). The incessant noise of the monitor stands for the pulse of people lying in the beds in their unit. On the screens, different colored waves dance jaggedly up and down in time with the tones. Usually they indicate that everything is all right with the patient.

If you end up with Judith Szücs and her colleagues then you may well be under the influence of alcohol, drugs, or both. Take 47-year old Christa for instance. She is lying dazed in Room U18 following suspected medication abuse. “When she arrived all she could tell us was that she had taken too many sleeping pills,” says the nurse. But only the result of the blood test brings certainty which substances are actually circulating in the body.

150 to 300 Patients – Daily

So far this Saturday night has been quiet at EUH. “Between two and five patients with drug or alcohol problems are admitted every day. That depends also of any major events in Hamburg”, says Dr. Ulrich Mayer, Director of the Emergency Room at EUH. He and his colleagues have been administering first aid and treating heart attacks, lacerations, and broken bones since 2007.

Between 150 and 300 patients are cared for every day. Many of these patients are stranded drinkers, especially in winter. “It is not without reason that these people keep finding their way back to us. They feel more comfortable here than they would in a makeshift shelter,” says Dr. Mayer. As if on cue, a Romanian staggers past along the bright corridor. “He has discharged himself, which often happens,” explains Sister Judith. It occurs when withdrawal sets in, which is when habitual drinkers need to get their blood alcohol back up to its normal level. “If someone arrives



Dr. Ulrich Mayer, Director of the Emergency Room at the University Hospital Hamburg-Eppendorf

here with three or more per mille, then they could easily have downed 2 bottles of vodka.” For heavy drinkers there is also the risk of life-threatening delirium tremens (see box). “Those cases end up in intensive care.”

An increasing number of young people populate the Emergency Room on weekends after binge drinking. Too many people are pushing alcohol to the limit. They drink hard liquor in record-time, then video their exploits for the Internet.

In Germany in the year 2005, 19,423 children and teenagers between 10 and 19 years of age received inpatient treatment for alcohol poisoning; six years later this figure had risen to 26,349. In addition to alcohol there are always drugs, a common reason for treatment. “Especially marijuana, cocaine, methadone, and mushrooms. We don’t really get synthetic drugs like crystal meth here,” says Dr. Mayer.

And that goes for tonight, on which a father brings his daughter to the Emergency Room. The delicate little 15-year-old shakes her head back and forth. “I feel so sick!” whimpers the girl. Sister Judith and Nurse Christopher come running. After a few words with her they know that she has drunk too much vodka. Her father found his daughter in the streets. Once her blood samples have been taken the 15-year-old is allowed to lie down on a mattress in the corridor. There, under the glaring neon lights of reception, she is watched constantly by staff. The girl could equally have slept off her state of drunken-

PHOTOS: PATRICK OHLIGSCHLAGER

What is delirium tremens?

Delirium tremens (literally: 'trembling insanity') or alcoholic delirium is a life-threatening complication arising from existing alcoholism and requires medical treatment. It occurs among five to 15 percent of alcoholics, either hours or days after their last drink. The mortality rate if untreated is around 20 percent, but if treated is about two percent. Withdrawal symptoms and their duration depend on the constitution of the alcoholic and his or her drinking habits. Anxiety, disturbed sleep, and autonomic disorders can however persist for up to six months and can cause patients, as they attempt to escape the symptoms in a kind of misguided 'self-therapy', to relapse.



Naive: After half a bottle of vodka this 15-year-old sleeps off her drunkenness

ness at home, but her father prefers to leave her here, “as a disciplinary measure,” he says. He has barely disappeared into the night when the next emergency rolls in.

Dangerous ‘Water’

Manuela lies on a stretcher accompanied by doctors and two police officers. This 15-year-old can no longer speak. She is asleep. Her friend has to explain why she is here, and excessive vodka is once again the reason. The Slavic word ‘vodka’ is a diminutive of ‘voda’, which in English means water. This girl had been drinking the high-percentage liquor straight out of the bottle with her friends – and it wasn’t the first time, her underage companion adds. While Manuela sleeps off the effects in the corridor, the police officers try to notify her parents. Only when the officers get through to her parents does it become apparent that they had believed their daughter was in her bedroom the whole time. Her parents arrive at EUH 30 minutes later. They don’t seem to be compassionate. Her father pulls out his mobile phone and snaps a pic. “We’ll put that in a place of honor to remind Manuela of this evening.”

As her parents leave the building at around 3 a.m. the beeping monitors and the dancing lines on the displays, signaling that everything is still all right.

Thomas Soltau

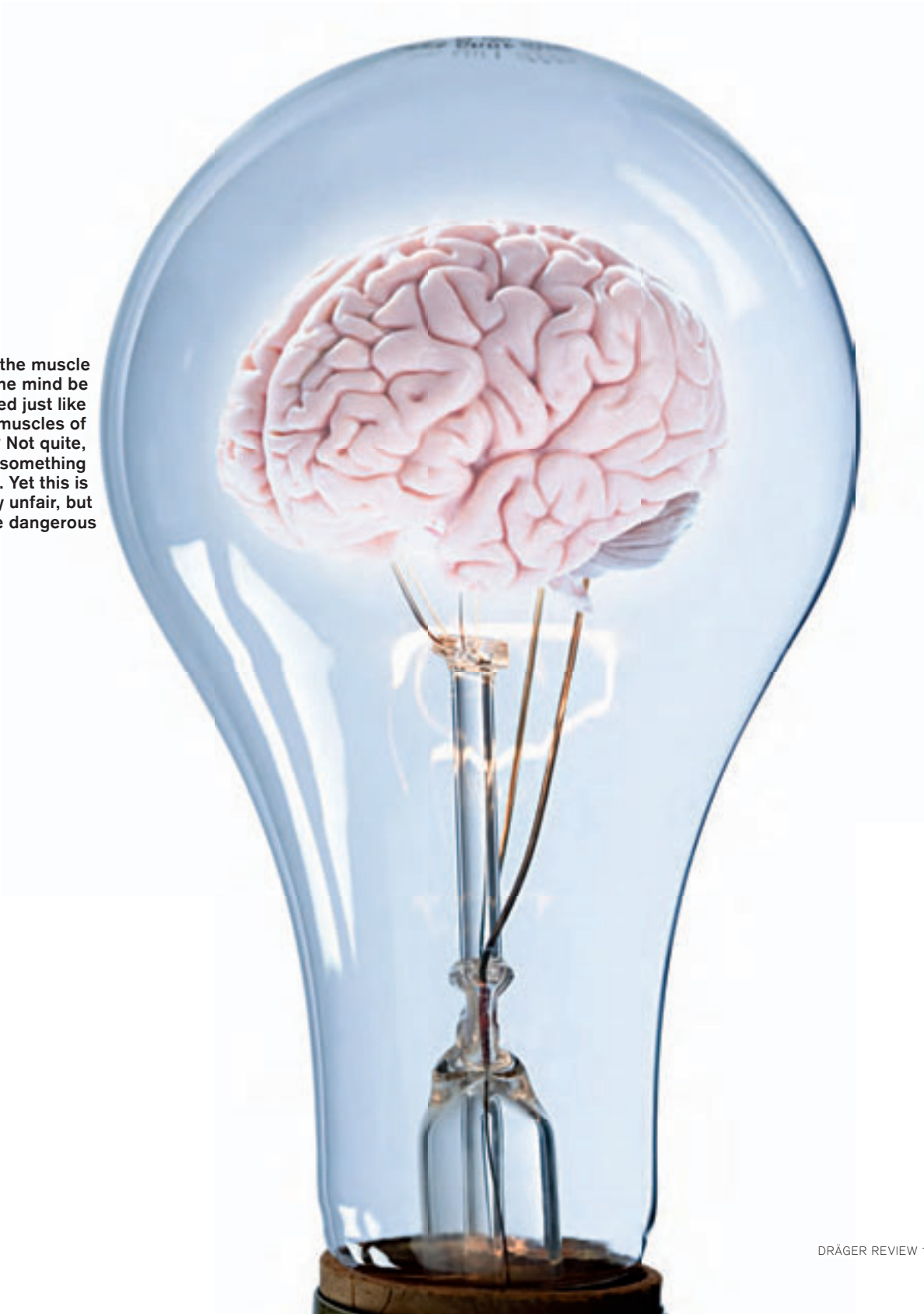


Interview: Prof. Dr. Rainer Thomasius on delirium tremens and the drinking games young people play.
www.draeger.com/107/er

Moral Dilemma

It certainly sounds appealing: take a pill – and get cleverer. Supporters of **COGNITIVE ENHANCEMENT** believe this to be possible. But is it really, and how high is the price for this?

Can the muscle of the mind be enhanced just like the muscles of the body? Not quite, but something like that. Yet this is not only unfair, but can be dangerous



If there's nothing there to start with, then performance enhancing drugs can't cook anything up, even if they do make existing knowledge available more quickly



Imagine Who Wants To Be A Millionaire, and imagine a player who gets every question right – no matter what subject. He picks up on every subtle hint the host drops, and wins the hearts of the audience with his quick witted way. He wins, and it is celebrated throughout the land – until he owns up: “I doped.” Hero-worship turns to angry disappointment, just as it did for Lance Armstrong, the former professional cyclist now banned for life from competing. Because doping is unfair and doping is cheating, right?

The effect a performance-enhancing substance has on a top athlete is easy to explain: more oxygen in the blood gives you more long distance endurance, and suppressing pain means extending the limits of what you can stand. But what is the mental equivalent of physical enhancement? Why has tournament chess long been subject to a substance ban monitored by the World Anti-Doping Agency? Which substances are aspiring superminds suspected of misusing?

Working Through the Night

A whole series of mechanisms can be involved. Tenacious learning of facts requires maximum concentration. Ritalin, the popular “fidget” drug could help. But if tiredness is damping your zeal, then the stimulant modafinil can get you working through the night. And to decrypt the emotional responses of a game-show host better than your rivals, you can take the human social-hormone oxytocin. It is available as a nasal spray. This is how brain doping is common-

ly understood. Scientists don't like that term, branding it a popular slogan. Substantive mental performance enhancer called “cognitive enhancers” or “neuro-enhancement supplements”. And they are looking for them urgently. “Dementia” is one of the keywords when it comes to research funding. Were pharmacology needs to succeed in halting the mental degradation of Alzheimer's long-term, that would be a feat on a par with the invention of antibiotics. But just like those anti-bacterial weapons, you can be sure that cognitive enhancers will spread beyond the people who really need them. This is the moral dilemma of brain doping.

Does Doping Help Society?

Using antibiotics without needing them and you could be harming everybody. Bacteria can become resistant. But what of somebody who tweaks their memory or boosts their attentiveness – how could that harm anybody else? Come to think of it, could not that person's increased productivity benefit society? Researchers from the United Kingdom and the USA advocated this viewpoint in 2008 in the scientific journal “Nature”, among them Brain Researcher Michael Gazzaniga, Stanford Law School Professor Henry Greely, and Neuroethicist Martha Farah. Their prescription: “Cognitive enhancement has much to offer for individuals and society as a whole, and an appropriate social response to it will be to make enhancements available and control the risks.” The experts wrote this in the knowledge >

The Candidates

Which groups of substances claim to tune the mind?

- ▶ The classic mental performance enhancers are psychostimulants such as amphetamines. These have not only been used illegally, but also semi-officially to keep pilots and soldiers awake and alert. In medicine they have been replaced to a large extent by amphetamine-like substances such as ritalin. They boost attentiveness, but can cause people to overestimate their own capabilities. Hard illegal stimulants include cocaine and even more dangerous derivatives.
- ▶ Tiredness can be alleviated using modafinil, which is prescribed to treat cases of narcolepsy.
- ▶ Brain-dopers have also experimented using medicaments that are prescribed for dementia such as acetylcholine esterase inhibitors and memantine.
- ▶ Anti-depressants are used with the intention of boosting performance by improving mood.

These are the drugs most often mentioned in studies. Then there are countless vitamins which are used to enhance performance together with the aforementioned substances, as well as permitted substances such as coffee and nicotine. More exotic approaches range from hormones like oxytocin (which is supposed to boost social intelligence) all the way to cannabis derivatives used to erase aspects of the memory which inhibit learning. So far the limited benefits of stronger substances have been eclipsed by a long list of serious side-effects.



PHOTOS: FRANK BOXLER, PICTURE-ALLIANCE / ZB

Start them early – ritalin tablets in the hand of a child (left). On the right, 450 students take a statistics test – some of them perhaps using ritalin. Brain doping at universities is much more widespread than previously thought

Dreams of Wakefulness

To enhance mental abilities - this desire is old. Millennia-old practices can help to achieve that. Meditation especially is one of them. Its techniques allow people to change their ability to concentrate, as well as the structure and chemistry of their gray matter.

The quick and convenient way, to greater alertness (for warriors on guard), endurance (for carriers or hunters), and sought mental abilities (visions of the shamans, the wise counsels), has lead through the ‚Garden of Nature‘ since prehistoric times: Khat , the everyday drug of North Africa acts like an amphetamine. Coffee and tea inhibit the fatigue signal in the brain. The leaves of the coca bush are a classic stamina-enhancer, that allow long concentrated work, even in thin Andean air.

It was not until the triumph of chemistry in the 19th century that high-strength pure substances came into play: amphetamines were synthesized in 1887, while their stronger sister ‚meth‘ was produced in 1893. Ritalin has been around since 1944, the modern anti-depressant version since 1984. Our modern understanding of neurochemistry and the structure of the brain allows us to design substances specifically for brain doping; hence the pharmacology used in fields such as modern anti-dementia drugs is still in its infant stages, and much progress may still be made in the future.

> that it is illegal for healthy people to use such drugs, practically all of which are only available on prescription (ritalin even falls under some narcotics acts). The hope is that controlled release will be better than letting things run wild. The prospects for professional brainworkers, already far beyond the exam room, are attractive believes, Mainz based Neuro Philosopher, Thomas Metzinger: a stimulant-consumer can write, calculate, or invent for 12 to 14 hours through the night from Friday to Saturday then spend the rest of the weekend resting and staying healthy, gaining a whole week’s worth of work every

month in the process – a genuine competitive advantage in today’s performance-boosted society.

Don’t just Look at Performance

But the truth is that the actual benefits that can be obtained from today’s brain doping are rather meager. If used incorrectly, stimulants like ritalin can even be detrimental to exam results. The stimulants reduced their self-criticism in the subjects and made them check carelessly wrong answers as true. So it is unlikely that we can expect a dramatic improvement in intellect, but

what we certainly can expect are side-effects. The least of these among doping substances is dependency. And then, for any substance which affects the metabolism of the brain in a significant way, there are the issues of lasting changes to the personality, the regulation of emotions, and memory loss after long-term use, none of which have been adequately researched.

As soon after the “Nature” authors published their piece, seven leading German experts produced a manifesto entitled “The Optimized Brain” in which they argued as follows: “No one can wish that the already present high social competitive pressure resulting from the proliferation of neuro-enhancement to further be increased. A continuous focus on performance and efficiency of life would be inhumane and isolating.” They did however claim that great opportunities lie in improving our understanding of the mental processes of learning and emotional regulation. These experts advocate research, but not a rush to the Internet drugstore: many future uses of enhancers are imaginable which could bring genuinely beneficial progress to people. What is important, they said, is to identify rules: “Above all it would seem sensible to establish higher safety and effectiveness standards for cognitive enhancers than those prevalent in therapeutic pharmaceuticals research; since they aim only at improving performance and mental state, not saving lives, healing, or alleviating illnesses.” **Silke Umbach**

The 20 Most Dangerous Substances

Dangerous drugs consume another: the junkies in front of the train station and the party kids who dope themselves with ecstasy and speed. The two or three beers in the evening are something else, right?

When it comes to how dangerous a drug is, the first question is its potential for physical and psychological dependency, and the seriousness of withdrawal symptoms – but also bodily damage. However, in order to be able to measure the “danger” by which we mean the overall damage caused by drug consumption, much more has to be taken into account.

That is exactly what David J. Nutt did at Imperial College London. Nutt is a Neuro-Pharmacologist and was – member and Chair of the Advisory Committee on the Misuse of Drugs (ACMD) – Government Drug Representative Gordon Brown, until he was dismissed in 2009, because he publicly began for an objective assessment of the dangers of illegal and legal drugs. After that he founded the Independent Scientific Committee on Drugs, which helped to produce a study in 2010 in which Nutt subjected the 20 most-used legal and illegal drugs in the United Kingdom to a thorough analysis. Nutt and his team laid down a range of criteria by which to evaluate these drugs in a 100-point system. More than half of the criteria relate to damage to the individual: physical damage such as bodily destruction and death, psychological damage such as dependency and impairment of mental and interpersonal abilities, and social damage such as loss of personal assets and the breakdown of human relationships.

With the other criteria they assessed the damage of drug use by third parties: the physical and mental injuries in the

family and in the wider surroundings, crime, misery, environmental damage, damage to society and economic costs, such as by medical care.

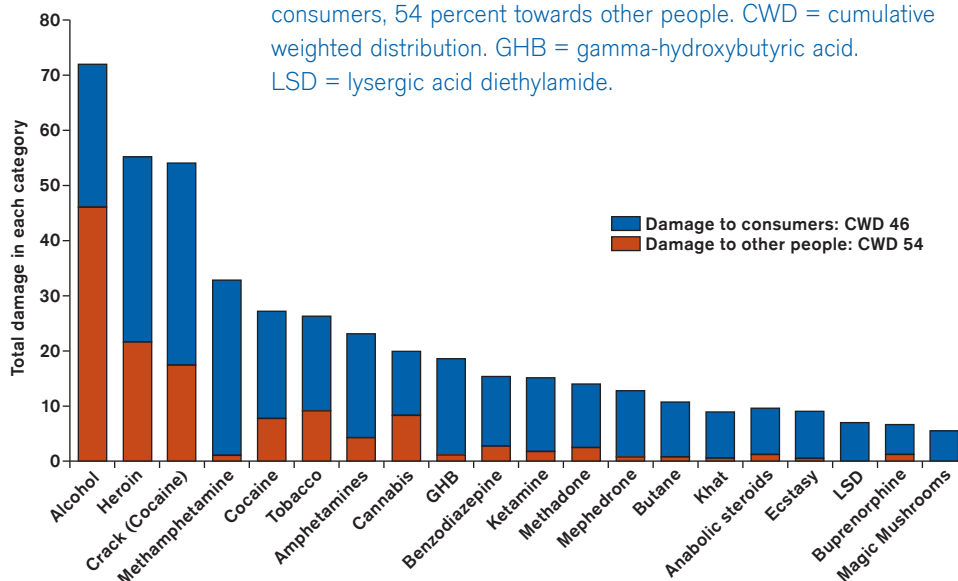
Alcohol and Heroin are at the Top

Heroin, crack/cocaine and methamphetamine are, according to this survey, the most dangerous drugs when it comes to addiction, mental damage, and mortality. But alcohol is close behind in fourth place on account of its potential for addiction. When it comes to damage in a consumer’s surround-

ings and to society in general, alcohol is the uncontested winner, partly of course because it is consumed by so many more people than heroin or crack/cocaine. Trailing behind in the list are LSD, magic mushrooms, and the opioid buprenorphine. Although only small quantities of these drugs suffice for a trip to high places, the overall damage to the user is much less, and to society almost zero. “Yet a low rating does not mean that a drug is harmless,” warns Nutt. “Every drug can be dangerous under certain circumstances.” **Regina Naumann**

High-risk – for others too

This graph depicts various drugs according to the total damage they incur upon consumers and other people. The figures are normalized (0 to 100), and then weighted: 46 percent towards consumers, 54 percent towards other people. CWD = cumulative weighted distribution. GHB = gamma-hydroxybutyric acid. LSD = lysergic acid diethylamide.



SOURCE (GRAPHIC): WWW.THELANCET.COM, VOL. 376, NOVEMBER 6, 2010; ILLUSTRATION: PICFOUR

A Bit of a Downer

In the states of **WASHINGTON AND COLORADO** marijuana is now allowed, but the euphoria disappeared with the smoke of the first joints. Strict rules limit the new freedom: municipalities prohibit stoner clubs, and U.S. laws still prohibit trade in and consumption of marijuana.



Rules must be followed – also in a drug paradise: a cannabis plant in Denver, Colorado, with a tracking ability

Medicine:
Michael Dare of
Seattle hoped
for relief from his
pain with mariju-
ana and consumed
the drug here
demonstratively
in public



Shivering, but clearly in a good mood, more than a hundred people gathered on the night of December 6, 2012, under the space needle, the symbol of Seattle. The moment the clock reached midnight the celebrating started to begin. ‘Initiative 502’ came into effect – the first time that marijuana had ever been legalized in an American state.

Giggling, joints and pipes were passed around. Police observed the spectacle, without interfering. They were responding to the blog notice on the website of their Police Commissioner: “Until further notice, police officers will not undertake actions in the face of violations of I 502 – apart from verbal warnings. We will give all of you a generous grace period to adjust to the brave new and kind of stoned world.”

Ever since then, anybody over the age of 21 may own an ounce of marijuana (just under 30 grams) for personal use and consume it in private in the north-western American state of Washington. Smoking in public remains prohibited, as does driving a vehicle while stoned, and the production and sale of the drug except for medicinal purposes. The state of Washington has one year to develop rules governing the cultivation of and trade in cannabis.

A month after the euphoria in Seattle similar scenes played out in Colorado. There, on January 5, 2013, Amendment 64 on the legalization of marijuana came into force. The amendment, which had been supported by 55 percent of voters, again allows anybody

over the age of 21 to own an ounce of marijuana; people of legal age may also grow up to six cannabis plants in enclosed areas. It is forbidden to sell the harvest – but not to give it to others for free. As in Washington State, you are not allowed to smoke weed in public or be under the influence of marijuana while driving a vehicle. Marijuana shops are not allowed within a 300 meter radius of schools, playgrounds, kindergartens, and public parks.

State Versus Federal

The situation is a complicated. So the U.S. federal law classifies cannabis as an intoxicant of the highest class without medical benefits with high risk of dependency – like heroin, LSD and ecstasy. Possession, acquisition, sales and production are punishable by harsh penalties. Even now the authorized use of cannabis, in 18 U.S. states and the District of Columbia, for medical purposes is still illegal under U.S. law. These contradictions engender gray-zones in the workplace. State employees are still subordinates of federal regulations – from police officers to teachers, from foresters to bus-drivers. But things are different in private companies. There, drug-testing is often part of job interviews; random sampling is also common practice. Up until now, marijuana in the bloodstream represented a reason to turn down your application or even fire you. Boeing does not intend to change this practice for now, while other companies have stated that they will be reviewing their employment con-

tracts. It will be hard to punish them in states with legalized marijuana drug use in the home, even if it interferes with job performance.

“It will be fascinating to watch how the state governments handle the new regulations, and how Washington D.C. and the industry will react – and of course, what consumers will do,” says Professor Mark Kleiman. Kleiman is an expert in criminal law and drug policy at the Luskin School of Public Affairs, which is part of the University of California in Los Angeles, and for years has been advocating more research on the legalization of marijuana. He accuses opponents and supporters alike of debating the issue with much too much propaganda and too little objectivity. “There is no way to study legal marijuana when marijuana is illegal. That is one of the reasons why I would like for Washington and Colorado to go ahead with the experiment. We should find out. Now we might.”

Film-maker Eugene Jarecki is a vehement proponent of the legalization of marijuana. In *The House I Live In* he documents the fatal consequences of the ‘War on Drugs’. The American anti-drug campaign was launched in 1971, and according to Jarecki has so far cost more than one trillion dollars, while the only real losers have been the poor and minorities, contributing to the overcrowding of US prisons. Around half a million people are doing time in the USA for drug offences, around ten percent of them having broken laws connected to marijuana.

As long as the Federal Government threatens crackdowns, marijuana won't be a business

> Opponents and supporters alike are waiting anxiously to see whether Washington will change its drug policy. President Obama stated at the end of 2012 that it was not one of the priorities of his government to assert federal law in this area. "It would not make sense for us to see a top priority as going after recreational users in states that have determined that it's legal." Democrat Patrick Leahy, who is Chairman of the US Senate Judiciary Committee, hinted at a possible compromise: "We could act complement so, that in states with relevant case-law, it is legal to possess an ounce of marijuana." Yet liberalization has its opponents too, and some of their support comes from the United Nations. The UN has declared that the decisions of the voters in Washington and Colorado violate international agreements and threaten agreements and threaten the health of society as a whole and of young people in particular.

But it is not just criticism of US federal drug policy that is shifting the mood towards legalization. High debt and empty coffers have helped local municipalities, state governments, and the federal government in Washington to recognize untapped potential of tax revenue in the billions. A group of 300 economists – including Nobel Prize-winners – have urged a sympathetic reassessment of the legalization of marijuana.

Taxes and Profits

They cite a study by Harvard Economist Jeffrey Miron which claims that the USA could earn an additional six billion dollars annually if it were to tax the drug in the same way that it taxes alcohol and tobacco. At the same time, the state could save a considerable sum by not prosecuting criminal cases relating to marijuana. Other studies have estimated the potential benefit of a legal-

ized marijuana industry at between 45 and 100 billion dollars per year.

Professor Kleiman, however, is worried at the prospects of a profit-making marijuana business. "Cannabis traders are not just interested in occasional smokers," he says, pointing out similarities with the tobacco and alcohol industry, which generates 80 percent of its business through heavy smokers and drinkers. "In my opinion there should be no commercial trading of marijuana. But of course, this approach will not bring lush profits or a big tax injection."

Ever since the legalization of marijuana, Colorado and Washington State have been working towards regulating production and the drug trade. In Colorado, politicians, security experts, marijuana activists, and business associations have been developing a legal framework. From October 2013 onwards, the authorities will be able to issue business licenses. In Washington the authority responsible for alcohol retailing licenses is also responsible for developing the equivalent legal framework for marijuana. This unsettles drug policy expert Kleiman, in whose view the development of alcohol licenses following Prohibition in the United States is the best possible example of how drug legalization should not be regulated: "Alcohol causes more damage in the USA than all other illicit drugs combined."

Targeting Young People

If marijuana becomes legal, fears Kleiman, then the industry will be

“Legalization Prevents the Drug War”

Since 1989 the world-famous magazine *The Economist* has been pushing the idea that "Prohibition has failed; legalization is the least bad solution." The liberal Londoners field various justifications. In the USA alone, 40 billion dollars are spent trying to prevent drug smuggling, and more than 6,000 police officers and soldiers die each year in the drug war. The chasm between low production costs and high retail prices is what finances criminal structures. Legalization would dry up this source and drug consumption would become more a healthcare issue than a criminal one. As with tobacco, if drugs were legalized, education about the health risks could limit consumption. "Our suggestion is a messy one," writes the magazine, "but a century of manifest failures argues for trying it."



Grass-green: Jake Dimmock, co-owner of the Northwest Patient Resource Center in Seattle, tends his marijuana crop, which is destined for medicinal use

able to advertise its product openly and design its marketing strategies specifically for young people. Investors and entrepreneurs are waiting in the wings to occupy the new market. Yale graduates Brendan Kennedy and Michael Blue have founded Privateer Holdings, the first ever venture capital company investing exclusively in marijuana-related business ideas. From marijuana vending machines called ‘Medbox’, to rating services for marijuana shops, to upmarket head-clubs like ‘Diego Pellicer’ which is managed by former Microsoft Manager Jamen Shively in Seattle, there seems to be no limits. If only there would not be the unclear legal situation between the federal government and the states still. As long as marijuana trade is still threatened by federal police raids, as long as US drug authorities keep closing businesses, and the US tax authorities keep confiscating earnings and prosecuting businesspeople on account of illegal activities, bankers will not give the new industry a chance. Entrepreneurs will be unable to obtain credit cards and bank accounts. Transactions between producers, retailers, and customers, as well as between business-owners and employees, are therefore all done in cash for the time being. Even landlords have been hesitant about providing marijuana companies with premises and storage space.

It will take years before scientifically, economically, and medically relevant results can be garnered from legalization.

Kerstin Zilm



Nancy Jo Armstrong (left) and Nancy King count the ballots from the marijuana petition in Washington state: 341,000 voters voted “Yes”



In Seattle, marijuana is weighed and packed – quite legally. If you are over 21, you are allowed to buy state-controlled and taxed grass in one of the governmental retail stores

PHOTOS: PICTURE ALLIANCE/AP PHOTO (2), PETER HALLEY/THE NEWS TRIBUNE (1)

No, No, and Again No!

Is there a **“RIGHT TO GET HIGH”**? The state claims to forbid citizens all sorts of things – certain drugs for example. This done for their own good, they say. Yet it overlooks utter drunkenness in many areas. Is this inconsistent?

No”, says the German Federal Constitutional Court in Karlsruhe, Germany. “No”, “No”, and again “No”. The Court issued its ‘Cannabis Decision’ on March 9, 1994. The judges examined whether citizens should have the right to intoxicate themselves at will – with substances that the legislature had prohibited. Part of the argument was that tolerating alcohol was done under a false pretext. The first “No” is the most far-reaching: “The consumption of drugs falls under the restrictions of Article 2, Section 1 of the Basic Law of Germany. There is no such thing as a ‘right to intoxication’ which would, were it to exist, escape these limitations.”

Intoxication is Hard to Prosecute

Article 2 of Germany’s Basic Law guarantees the right to “free development of the personality”. Each individual may do what he or she pleases. Yet this comprehensive promise soon finds itself limited: you may do anything, “provided it does not infringe on the rights of others or violate the constitutional order or moral customs.”

So which of these things is a drug consumer doing? It is a question which has caused many judges headaches. There was a mushrooming of lawsuits under the German Narcotics Act (BtMG) in the 1970s and 1980s. Faced with a wave of hashish and tragicheroïn cases as depicted in the cult classic *We Children from Bahnhof Zoo*, the state felt forced to confront a situation it perceived as extremely threatening. The road to the highest authority was inevitable.

Wolfgang Nešković, currently a Member of German Parliament, but then a judge at the District Court of Lübeck, set the ball rolling in 1992. Nešković’s criminal chamber considered itself unable to convict a defendant under the terms of the German Narcotics Act. Its main arguments were as follows:

- That legislators were treating alcohol consumers tolerantly, thus violating the basic principle of equality established in Article 3 of the Basic Law;
- That intoxication was and had long been a cultural norm, and therefore part of the development of personality protected by Article 2;

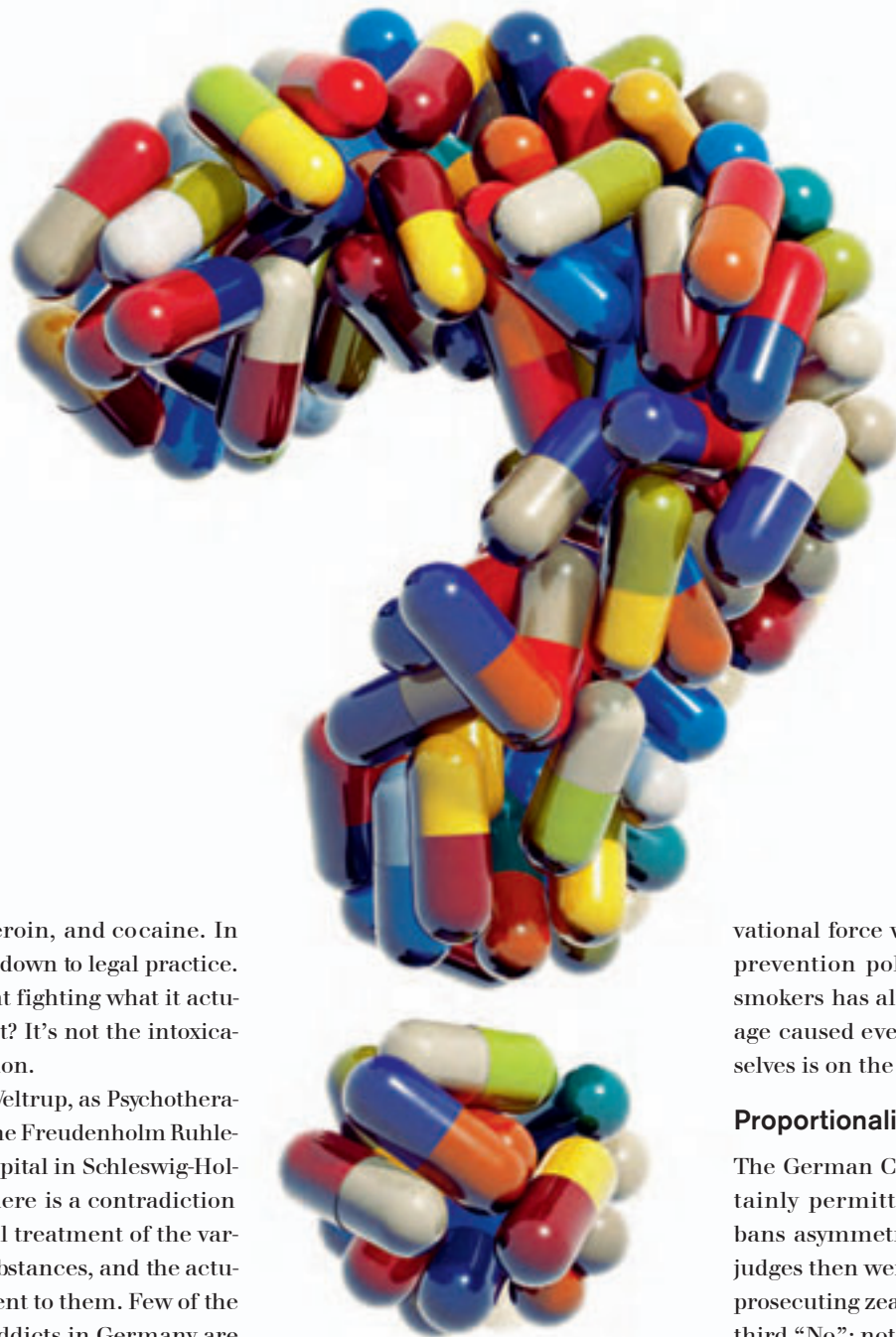
- That the policy of punitive drug prevention did not work.

The Constitutional Court responded, however, that “the prohibition of cannabis products does not force anyone to fall back on other intoxicants that are not subject to the German Narcotics Act, such as alcohol.” For reasons of legal certainty, the legislature decided to create a definitive list of banned substances. Nobody would be prosecuted, they said, for intoxication in itself. And how could they be? If they were, lawmakers would be obliged to ban nail-polish-remover, adhesive, and gasoline when they learned that “sniffer” used these substances to intoxicate themselves.

The Addiction Fight

The second “No” from the Constitutional Court is clearly thus: not all poisons have to be treated equally. It is not necessary to legalize drugs, even if they are not causing problems at home in Germany, since Germany has long been bound under international treaties to forbid a whole catalogue of substances. Cannabis is one of them, as are amphet-

PHOTO: SHUTTERSTOCK



amines, LSD, heroin, and cocaine. In the end it comes down to legal practice. Is the government fighting what it actually wants to fight? It's not the intoxication - it is addiction.

Dr. Clemens Veltrup, as Psychotherapist who directs the Freudenhofm Ruhleben specialty hospital in Schleswig-Holstein, believes there is a contradiction between the legal treatment of the various addictive substances, and the actual dangers inherent to them. Few of the 1.3 million pill-addicts in Germany are seen at inpatient addiction therapy. "Only 700 of them attended clinics in 2012," he says. In the field of illegal substance treatment, on the other hand, large infrastructures have developed over the decades. Laws also have risks and side effects.

Pragmatists know ideal laws will never happen. But there are specific fields in which conditions can be improved. On the roads, for example, completely legal medicines represent a significant danger; tranquilizers are being examined particularly closely in this respect. Danger to others is the strongest moti-

What should the State prohibit its citizens to do concerning their best interests? What lawyers argue about, has real implications in practice

vational force when it comes to future prevention policy. Protecting passive smokers has already worked: the damage caused even to the smokers themselves is on the decline.

Proportionality is Important

The German Constitutional Court certainly permitted legislators to place bans asymmetrically in 1994. But the judges then went on to set limits on the prosecuting zeal of the courts with their third "No": not everybody caught carrying a small amount of hashish should be brought before the court. The key statement ran like this: "The imposition of criminal penalties against experimental and occasional users of small quantities of cannabis products can lead in their effects on the individual perpetrators to inappropriate and special preventive measures that may cause rather adverse results."

Nobody, therefore, has a right to be in the state of intoxication. But in the fight against addiction, it is important to preserve proportionality - the law does not allow an iron fist policy. **Silke Umbach**

Drugs – ABCs

Here is a brief, factual tour of **COMMONLY USED DRUGS** – their active ingredients as well as methods of use, risks, prevalence (frequency of use), origin, and history. A stroll.

Alcohol

Active ingredient: ethyl alcohol (ethanol)

Form of consumption: drunk in various forms and mixtures with very diverse alcohol contents between 2 percent (fermented mare's milk, 'kumis') and 95 percent (corn schnapps, 'Everclear').

Effect: see page 22.

Prevalence: in the countries of the European Union, consumption among people over 15 is 12.5 liters of pure alcohol annually – which is twice as high as the global average.

Risks: the EU and WHO list more than 40 recognized alcohol related diseases, alcohol also "plays a role in numerous other health problems, such as injuries and fatalities on the roads." In the countries of the EU, 10.8 percent of all deaths in 2004 in the age group between 15 and 64 were a result of alcohol consumption. Another 3.3 percent of this age group died as the result of other people's alcohol consumption.

Origins and history: see pages 10–11.

Synonyms: booze, hooch, firewater.

Fortification: around 3100 BC, workers on the pyramids were given five liters of beer daily as a supplement to their diet and to keep their mood up.

Benzodiazepines

Active ingredient: a group of compounds whose basic constituents are 1,4- or 1,5-benzodiazepines. They were developed as tranquilizers for calming and sleep-inducing purposes; their international non-proprietary names



A drug's effect and risk cannot be seen from the outside

often end in -azepam: Diazepam, Lorazepam and Oxazepam. Trade names include Valium, Librium, Rohypnol, Tavor, and Praxiten.

Form of consumption: as tablets or injected intravenously.

Effect: anxiolytic, relaxing, soothing.

Risks: memory disorders, impaired reactions, and perception – consequently: driving impairment; addictive if taken long-term without medical supervision.

Origins and history: traces of benzodiazepines occur in human and animal blood as well as certain plants. They were discovered more or less by accident in the USA in 1957. The first medicine in this group came onto the market in 1960 under the name Librium, and Valium followed in 1963. It was not until the 1980s that their addictive potential was recognized; a study of this group of substances in 2008 nevertheless foretold that “they will still be prescribed for many years to come.”

Synonyms: tranks, benzos, vals; rosh and roofies for rohypnol.

Sleepless: “My wife doesn’t let me take Valium,” said benzodiazepine’s inventor Leo Sternbach to *The New Yorker*.

Cannabis genus of the hemp plant

Active ingredient:

Tetrahydrocannabinol (THC)

Form of consumption: usually smoked, mixed with tobacco in cigarettes, as blunts (larger) or joints (smaller), or with special hashish pipes. The effect occurs here almost immediately, delayed when cannabis drinks, yogurt, and baked cookies are consumed.

Effect: accentuates existing positive or negative moods; makes consumers considerably more upbeat. Feelings of relaxation, inner peace and equilibrium; often reduced drive. Cheerfulness and heightened social communicativeness are also observed.

Prevalence: almost 25 percent of all Europeans aged between 15 and 64 have consumed cannabis at least once in their lives. 6.8 percent of the same age

group have consumed it within the past twelve months – or one out of three people have experimented with cannabis.

Risks: restricted physical and mental capacity, coupled with self-overestimation; inability to drive. If consumed heavily and regularly: psychological dependency, passivity.

Origins and history: its home is probably the Middle East and Central Asia. Used in folk medicine (to reduce the pain of neuralgia, migraine, and seizure disorders), but also in all cultural circles as an intoxicant. First mentioned in 2700 BC in a Chinese book of medicines. Its use as a remedy with euphorizing effect that began in 19th century Europe.

Synonyms: dope, ganja, bud, grass, weed, hash, pot, piece, shit, spliff.

Queen of Pot: physicians prescribed cannabis for Queen Victoria (1819–1901) to treat period pains.

Cocaine crystal-like powder made from the leaves of the coca bush

Active ingredient: Cocaine

Form of consumption: sniffed, intravenously injected, and smoked (crack).

Effect: stimulates the central nervous system strongly by suppressing the re-uptake of noradrenaline, dopamine, and serotonin in synaptic vesicles. Immediately effective, euphorogenic, stress-reducing. Loss of inhibition coupled with increased energy and creativity.

Prevalence: around 4.6 percent of all Europeans aged between 15 and 64 have consumed cocaine at least once in their lives. 1.2 percent of the same age group have consumed cocaine during the past twelve months – or one out of four people have experimented with cocaine.

Risks: rapid psychological dependency, all the way to ‘cocaine psychosis’; impurities in filler substances increase the risk of side-effects.

Origins and history: the coca bush has been cultivated in South America

for a good 5,000 years. Its leaves may only have been used for ritual activities initially. When impoverishment set in with the Spanish conquest, large sections of the population used the plant to stave off hunger and cold, and to increase their productivity. The active ingredient was isolated around 1860 and used initially as a local anesthetic and anti-depressant. Cocaine epidemic among artists and intellectuals in the 1920s; renaissance in the 1970s and since the early 1990s as a ‘performance drug’.

Synonyms: coke, snow, blow; crack and rocks (for crack).

Descent: “If you wanna get down, down on the ground, Cocaine” – JJ Cale (1976).

Crack cocaine hydrochloride mixed with alkalis → Cocaine

is smoked. First appeared in 1983/84 on the West Coast of the USA.

‘Designer Drugs’ Amphetamines (‘speed’) and Methamphetamine (‘ecstasy’)

Active ingredients: these structurally similar and synthetically produced designer drugs belong to the substance category of beta-phenylalkylamines (beta-phenethylamines).

Form of consumption: usually swallowed, more seldom sniffed, taken intravenously, or even smoked (methamphetamine).

Effect: as an analeptic it provides a lift and produces wakefulness, vitality, and self-confidence; methamphetamines often have a much stronger effect than amphetamines (see also page 23).

Prevalence, amphetamines: around 3.8 percent of all Europeans aged between 15 and 64 have consumed amphetamines at least once in their lives. 0.6 percent of the same age group consumed amphetamines in the last twelve months – or one out of six people have experimented with amphetamines.

Prevalence, ecstasy: around 3.4 percent of all Europeans aged between 15 and 64 have consumed

ecstasy at least once in their lives. 0.6 percent of the same age group consumed ecstasy in the last twelve months – or one out of six people have experimented with ecstasy.

Risks: overdose and side-effects, especially in the case of impure and intravenously administered drugs; hallucinations, psychological dependency, collapse, dehydration.

Origins and history: the colloquial expressions 'designer drug' and, in Germany, 'Weckamine' (which means 'wake-amines') describe on the one hand the intentional synthesis of these substances in the laboratory, and on the other hand their effect. In 1887 the Romanian chemist Lazăr Edeleanu synthesized amphetamine in Berlin, which was used from 1933 onwards as Benzedrine to treat colds. But its stimulant side-effects soon came to the fore – in environments such as the military, which since World War II used amphetamines to increase performance, and also in sport. A new dimension of misuse began in the 1960s with injected amphetamines, which continues to this day; the 'party drug' is now consumed in various forms. The development of methamphetamines occurred in parallel: synthesized for the first time in 1893 in Japan, they became commonplace in almost every army in the Second World War thanks to their stimulant effects – in Germany under the name Pervitin, which was patented in 1937. As with MDMA (ecstasy), which was first synthesized in 1912, these uses eclipsed potential medical applications in the treatment of colds and the stimulation of appetite. Used for doping, ecstasy in particular has become the unhappy star of the music scene since the mid-1960s.

Synonyms, amphetamines: speed, pep, white, crank, uppers.

Synonyms, methamphetamines: ice, meth, crystal, glass, Tina; for ecstasy: E, Adam, XTC, beans, X, MDMA, love drug.

Nobel plea: "The service is tight ... today I am writing primarily about Pervitin. ...

Yours, Hein," telegraphed Nobel Prize for Literature winner (in 1972) Heinrich Böll from Poland on November 9, 1939 to his parents in Cologne.

Diazepam → Benzodiazepines

Indispensable: the WHO includes it in its list of 'Essential Medicines' that belong to the minimum equipment for basic medical care.

Ecstasy → 'Designer Drugs'

Hashish resin from the blossoms of the female hemp plant

Active ingredient: tetrahydrocannabinol (THC), levels between five and 20 percent depending on origin.

→ Cannabis

Pothead in Berlin:

"From now on a joint must always be burning on German soil!" declared actor and cabaret artist Wolfgang Neuss (1983).

Heroin → Opioids

Synonyms: H, stuff, junk, mud, tar, skag, brown sugar, smack, China white, chiva, dragon.

À la mode: in 1986 *The Sunday Times* coined the term 'Heroin Chic' to describe heroin consumer culture, especially very thin, pale models.

Ketamines

Active ingredient: a so-called 'dissociative anesthetic' closely related to hallucinogens (phencyclidine derivative).

Form of consumption: drunk in a watery solution or sniffed as a powder (Ketanest, Ketaset, Ketalar); more rarely intravenously injected.

Effect: produces a kind of cataleptic state in which the consumer sees himself as disconnected from his surroundings and body ('K Land'), and from time ('K Hole'). Bizarre, sometimes terrifying dreams, visual and auditive hallucinations.

Prevalence: incomplete, inconsistently collected data estimates usage at around 2 to 4 percent among young adults (15–34 years) in selected EU countries.

Risks: collapse if overdosed, psychoses if consumed regularly, lasting state of fear even after small doses – given genetic disposition.

Origins and history: developed as a fast-acting anesthetic from 1962 in the USA, where it was approved in 1970 then used immediately, including in the Vietnam War; non-medical consumption initially among 'psychonauts', today as a 'club drug' at raves, etc.

Synonyms: Special K, Vitamin K, jet, super acid, Kit Kat, bump.

Paradise: "If captains of industry, leaders of nations could partake of this love medicine the whole planet might be converted into the Garden Of Eden." Psychonaut Marcia Moore in *Journeys Into the Bright World* (1978).

Marijuana dried, shredded pieces of the female hemp plant

Active ingredient: tetrahydrocannabinol (THC), levels between 1 and 7 percent depending on origin; Dutch greenhouse strains (skunk, sinsemilla, Nederwiet) up to 22 percent.

→ Cannabis

Beat poetry: "I could do these things endlessly on grass," wrote Jack Kerouac to his friend Allen Ginsberg.

Methadone

Active ingredient: synthetic → Opioids

Form of consumption: in powder or tablet form, as drops or syrup; taken orally when used legally as part of substitution therapy for heroin addicts; illegal usage both oral and intravenous.

Effect: similar to other opioids, but weaker and more delayed.

Prevalence: lifetime prevalence estimated at 0.2 percent.

Risks: dependency, death following massive overdose.

Origins and history: first synthesized in 1939 by I.G. Farben as 'Va 10820', and produced initially in small quantities from 1942 onwards as a painkiller under the name 'Amidon', before being re-named 'methadone' in the USA in 1947. Used in the USA from the late 1940s

onwards to compensate for the withdrawal symptoms suffered by patients addicted to heroin; in Germany from 1950 onwards (as 'Polamidon'). First experimental methadone program in Germany between 1973 and 1975 in Hanover. Substitution programs using methadone were established in Germany from around 1990 onwards following positive research work there.

Synonyms: dolly, doll, red rock.

Curative: the idea that methadone (Amidon) entered the market as 'Adolphine' prior to 1945 proved to be an urban legend spread in New York in the 1970s to discredit methadone substitution therapy by associating it with the Nazi regime.

Opioids (active in drugs such as morphine, opium, heroin, codeine, etc.)

Active ingredients: naturally occurring or synthesized substances which stimulate what are known as the opioid or μ -receptors in the brain and spinal chord.

Form of consumption: smoked, eaten, sniffed, or intravenously injected.

Effect: induces states ranging from exuberant happiness (heroin) to fantasies and (erotic) hallucinations.

Prevalence: the number of 'problematic opioid consumers' in Europe is estimated at 1.4 million. Three percent of all drug-induced deaths among Europeans aged between 15 and 30 are connected to opioids.

Risks: heavy dependency, death if overdosed, severe withdrawal symptoms ('turkey') – especially after heroin.

Origins and history: opioids emerged in what is now Turkey more than 8,000 years ago as opium, which was garnered from the opium poppy. Juice obtained from scored, unripe poppy seed capsules was made into pills and used as a medicine to alleviate pain. Opium has only been smoked since the discovery of America by the Europeans, who brought tobacco and pipes back home with them. It found its way to China via contemporary Indonesia

in the 17th century. In Europe, opium was used as an analgesic mainly from the 18th century onwards. Morphine, the most important main alkaloid, was isolated from opium in 1804; heroin, which has an even greater potential for addiction, was synthesized in 1898. During the early decades of the 20th century the medicinal use of opioids, especially heroin, shifted to misuse as an illegal drug (pre)produced mainly in the 'Golden Triangle' of Thailand, Laos, and Myanmar, as well as Afghanistan. In Germany opioids are the primary drug involved in half of all drug therapy inquiries.

Piercing damage: "I've seen the needle / And the damage done" – Neil Young singing about the demise of a heroin-addicted guitarist on the album *Harvest* (1972).

Opium

Active ingredient: morphine → Opioids

By the book: "Whoever wishes to smoke opium must purchase a permit personally from the responsible Opium Officer. The fee for this permit shall be one dollar a month, and must be paid quarterly in advance" – Paragraph 5 of the 'Ordinance on Opium' issued by Imperial Governor Meyer-Waldeck in Tsingtao, 1912.

Speedball blend of cocaine with morphine or heroin

Pushing the deadline: the physician Lord Dawson of Penn injected a fatally ill British King George V with a deadly mixture of cocaine and morphine on January 20, 1936 at around five minutes to midnight, "so that the announcement of the King's death could be published in the morning edition of the newspapers..."

Valium → Benzodiazepines

Kids on your nerves: "And though she's not really ill / There's a little yellow pill" (*Mother's Little Helper*, The Rolling Stones, 1965).

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