

Keeping Tabs on Drug Abuse

The European Union intends to reduce the number of traffic fatalities by 50 percent in 2010. As a result, there is growing interest in **DRUG TESTS** to accompany the tests for alcohol. The Dräger DrugTest 5000 is ideal for such a task, as it combines portability, speed, and precision. It can also be used in the workplace or in therapeutic settings



The saliva test with a unique oral fluid collector (below right) makes it possible to carry out reliable drug tests quickly. The definitive result appears on

Narcotics glossary Illegal substances have their own language. The President's Office of National Drug Policy in the U.S. alone
A-Bomb—a marijuana cigarette containing heroin or opium **Acid**—lysergic acid diethylamide (LSD) **Adam**—ecstasy (e.g. MDMA, 4-methylenedioxy-N-methyl)

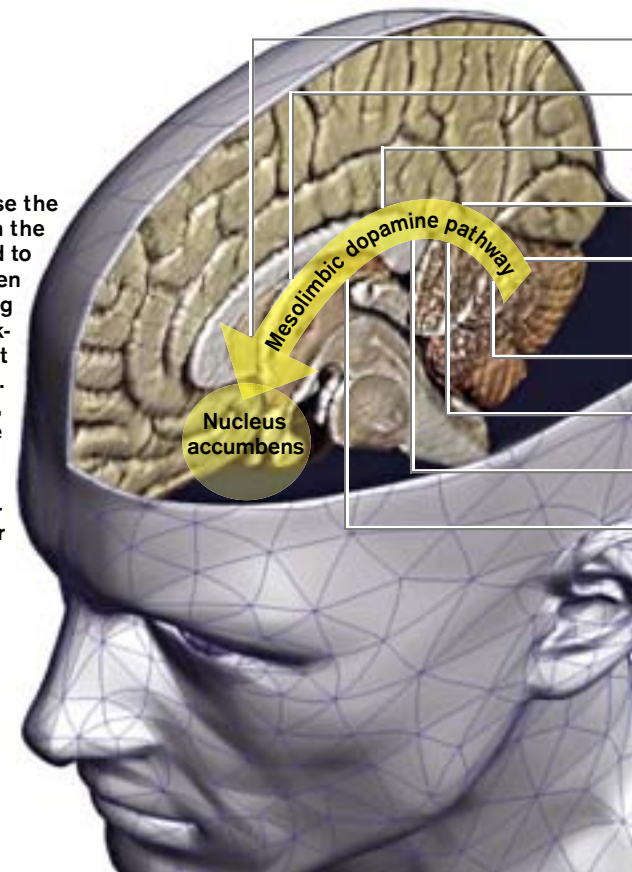
> are “standard procedure” in traffic stops, at the workplace, and in medical applications. Devices like the Dräger Interlock XT can also be combined with an automatic vehicle immobilizer.

“Police officers want a device that will provide a reliable preliminary test for drugs—one that’s also as fast and easy to use as the breathalyzer,” says Hans-Jürgen Maurer, a senior detective in the Saarland State Police Department in Germany and a pioneer in methods for determining drug consumption by motorists. International research projects like ROSITA and DRUID, in which Maurer is also involved, have shown how much still needs to be done here. “In the ROSITA project, drug detection devices were initially tested throughout Europe for practicality, detection sensitivity, specific drug recognition capability, and precision,” says Maurer. “However, none of the equipment satisfied all of the police departments’ official requirements for such test systems.”

A Dräger unit was also reviewed in the study, where its reliability was shown to conform to the legal requirements, although it did not fulfill some of the other demands. “We learned from experience,” says biologist Dr. Andreas Manns, who is responsible for International Marketing in the Drug Test division at Dräger, and is also a member of the team that conceived a completely new piece of equipment—now available as the Dräger Drug-Test 5000. “Our first step was to break

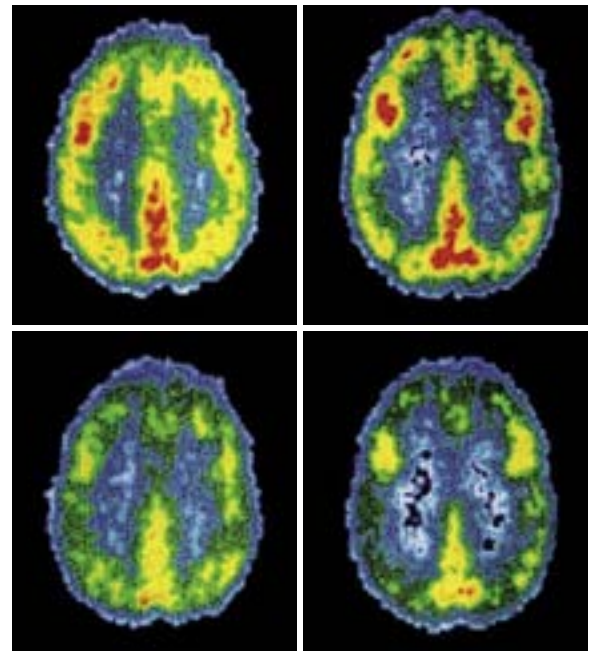
ILLUSTRATION: BELOW: STARR, CEGIE AND RALPH TAGGART; BIOLOGY: THE UNITY AND DIVERSITY OF LIFE, 7TH ED. WADSWORTH PUBLISHING CO. BELMONT, CA. 1995 ABOVE: ANDREJ BAROV

All drugs increase the levels of dopamine in the body. This can lead to dependency or even addiction. Every drug works differently, docking on to a different location in the brain. All of them, however, affect the dopamine pathway (right) to produce a greater or lesser degree of addictive behavior

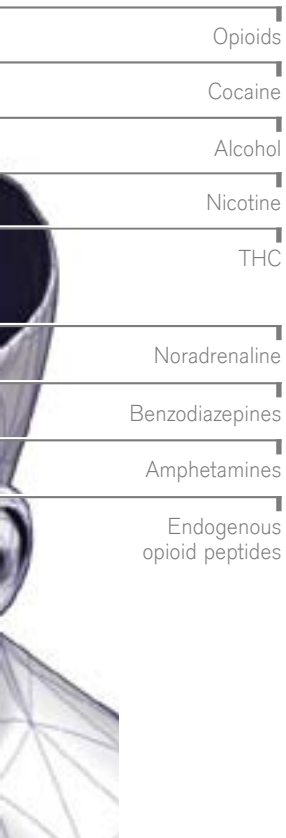


From artificial paradise to addiction—how drugs

From the mucous membranes straight to the brain: cocaine smoked as crack depresses brain activity. The upper images show the brain’s normal state, the lower ones brain activity eight seconds after inhalation. The PET images indicate the degree of brain activity by the colors red, yellow, green, and blue in descending order



> **C(harly)**—cocaine **Cad(illac)**—one ounce (28.4 grams) of cocaine **Chillum**—traditional tube-shaped hashish pipe **Crack**—cocaine made smokeable by = phencyclidine (PCP), an anesthetic with hallucinogenic effects **Ganja**—marijuana (Jamaica, but also Thailand) **God’s medicine**—opiate **Idiot pills**—barbi



ugs work

In the end, everything—every emotion, feeling, mood, or picture—can be reduced to a biochemical process. Some “drugs” are produced by the body itself. For example, physical exertion releases endorphins—relatives of opium—which trigger euphoria. Joggers call this feeling, which helps to boost performance, “the runners’ high.” Drugs use extremely similar substances to artificially produce such feelings. The pleasant effects activate the dopamine-based reward system in the brain and, in an extreme case, create drug dependency, popularly known as addiction. Instead of the “artificial paradise” of hashish and opium experiences as celebrated by the French poet Charles Baudelaire in 1860, the hell of lifelong dependency beckons.

off our collaboration with an American company—due to a critical patent situation—and to invest in a completely in-house development,” he says. Manns explains that such internal development is the only way to reliably and sustainably ensure precision, speed, and ease of use, as well as a favorable price-performance ratio in comparison with the laboratory supported routine process that was previously used.

Saliva is special

The Dräger DrugTest 5000 works with saliva, as there are ethical and legal reservations concerning the use of blood or urine samples. “Some police officers have had to wait an hour for a urine sample on more than one occasion,” Manns says. The unit’s test for amphetamines, designer amphetamines, opiates, cocaine and its metabolites, benzodiazepines, and cannabinoids takes place in just a few steps. Saliva provides an “image”—an ultrafiltrate—of the blood. But it’s a very special fluid, and not just in terms of its viscosity, as Manns explains: “Depending on sex, ethnicity, and the natural condition of the subject, saliva samples can show extreme variations. These must be considered, both when taking the sample and in the analysis.” The latter is done completely automatically in a portable Analyzer, which displays a green light for reproducible results after it conducts its initial self-testing run.

The saliva sample is taken by placing the patented oral fluid collector in the subject’s mouth and holding it in the cheek pouch or under the tongue. Capillary forces in the porous collector at the front end hygienically collect the saliva. After about one minute, during which time the approximately 300 microliters of saliva required for the test have been collected, the collector’s indicator turns blue—a color that is easily recognized, even in low light conditions.

The test kit is then inserted into the Analyzer, along with a cartridge containing a buffer solution. After five minutes, the result is almost complete—for five classes of substances. Only the test for THC—tetrahydrocannabinol, the active ingredient of cannabis—takes a further five minutes. “THC is hydrophobic and is therefore only present in saliva in low concentrations,” Manns explains. “It’s also difficult to detect, so the analysis takes a little longer.”

The art of chromatography

The analysis itself is carried out using an immunochromatographic process. The sample is first pumped out of the oral fluid collector and into a collection tank with a force of up to 100 newtons, before being transported to the test strip. There, it reacts with antibodies present in both liquid and solid forms at different points. At the same time, the Analyzer’s built-in “air conditioner” ensures constant reaction conditions in the test magazine. The >

..... baking with baking powder and water **Dagga**—marijuana (mainly from S. Africa) **Doobie**—“joint”—hashish/marijuana cigarette **Flake**—cocaine, but flakes
 turates **Kiff**—joint, also extremely strong marijuana from the Middle East **Killer weed**—marijuana **Lemonade**—poor-quality drugs **Number 3**—heroin or cocaine >



The carrying case holds everything needed for mobile drug testing

> high power necessary for this is supplied by a reliable and high-capacity lead-acid battery. If the test is positive, a biochemical reaction occurs with the reagent located at the corresponding position on the test strip, causing a color change. The resulting pattern of the strip is then read within the unit by optoelectronic sensors and evaluated—this comparison is more sensitive and less ambiguous than an assessment by the human eye. The result then appears clearly on the color display, which can be easily read at various angles. The Analyzer can log up to 500 measurements internally and output them in an Excel file format via a USB interface, to-

gether with the optional associated sample data, which can be scanned using a barcode reader, or personal data.

“State of the art”

There is an approximately 90 to 95 percent probability that a subsequent urine or blood test (only the latter test is accepted as evidence by courts in Germany) will confirm the preliminary test. “From the users’ point of view, Dräger has obviously succeeded in combining the immunological test with reliable software,” stated Maurer in his comparisons. “In my opinion, the DrugTest 5000 represents the state of the art.” The Analyzer

assigns weightings to the measurement results so that a result weighted internally within the confidence interval is digitally indicated as a definite “positive” or “negative” on the display. The statistical evaluation is delicate. A lower sensitivity threshold (cut-off detection limit), for example, is appropriate for a stricter, more prevention-oriented procedure. A higher threshold, in contrast, lowers the follow-up costs, as subsequent blood tests will be much more likely to confirm the positive result. “We think it’s especially important that a high probability of recognition is achieved through the unit’s precise analysis,” says Maurer. “It’s also crucial that the statistical methods used don’t deliver too many ‘false negatives’—in other words, cautious results that do not register drug use even though it has occurred.”

“In my opinion, this unit obviously achieves all of these objectives,” says the Saarland “drug identification officer.” Maurer estimates that it will take a further four to five years to achieve a nationally standardized regulatory system for the introduction of this type of drug-testing equipment. But, as he says, “It’s clear that Dräger’s development could form the basis for future standards.”

PHOTOGRAPHY: STEFAN WILDHIRT

When it comes to acceptance, the easy operability of the unit is also a key advantage. Manns and his team went to great lengths to optimize this feature. For example, they ensured that various prototype designs were tested by a large num-



Drugs at work—a European regulatory system is badly needed

Dr. med. Rolf Breitstadt is the Medical Director of Evonik Industries AG and one of German industry’s leading specialists in occupational and environmental medicine: “Drug abusers endanger not only themselves but also other people—at work too. This is particularly the case when their job demands a high degree of mental effort. That’s why we carry out drug tests on urine samples during hiring examinations since 1996. Up to six percent of the results are positive. As a specialist in occupational medicine, with responsibility for protecting employees from the actions of drug abusers, I would like to see a clear and, if possible, Europe-wide regulatory system for drug testing in the workplace with results that are admissible as legal evidence. I am doubtful, however, that we will see such a European system in the near future. Something bad will probably have to happen first.”

> **Pusher**—drug dealer **Scag**—heroin **Score**—to purchase drugs **Scottie**—cocaine **Sextasy**—ecstasy with Viagra **Snort**—to ingest amphetamines, heroin
 a hypo dermic needle; an injection of a drug **Tab**s—LSD in capsule form **Tea**—marijuana **Uncle**—a federal narcotic agent **Ups/uppers/uppies**



Psychologist Dr. Clemens Veltrup (right), head of a number of large-scale institutions for addiction therapy in Germany, is convinced of the Dräger DrugTest 5000's advantages in the therapeutic context

ber of potential future users. Eventually, they settled on a simple method of operation that can be carried out in just a few steps—using either the right or left hand, and even while wearing gloves. “You never know how creative users will be when they try to insert the sample into the Analyzer,” he points out.

Not only for drugs

The DrugTest 5000 represents a body of work that will not only enhance road safety, but also point the way ahead. Manns intends to speed up the time it takes to conduct the test. He and his team are also considering using the test's fundamental biochemical concept for a precise, simple, economical, hygienic, and mobile test for illnesses such as HIV. “We definitely have the expertise with antibodies,” he says.

Maurer doesn't expect to see a European-wide regulatory system in place for another seven to ten years. He also knows how difficult it will be to establish such a system, given the lessons learned in the U.S., where “the procedure for drug tests—for example, using blood or urine samples—differs from state to state.” Still, the breathalyzer-style test for drugs might possibly be out on the streets by the year 2015.

Nils Schiffhauer

Further information online, including:

- Product information
- User Instructions

www.draeger.com/96/Diagnostic

Face to face in therapy

Drug therapy relies on trust, yet it cannot function without frequent routine controls. Anyone participating in a drug rehab program is subject to temptation—in particular when placed under stress or sent home for a time, but also during onsite treatment at a rehab center. To date, we have exclusively relied on urine samples for drug control, as have most other clinics.

The possibility of sample manipulation, however, makes visual monitoring of the sampling procedure essential. This process necessitates an intrusion into the patient's personal realm, something patients perceive as degrading and threatening, and which therefore erodes trust as well. Staff members also find this unpleasant, as it interferes to a great extent with the establishment of a trusting relationship with patients, and can thus have negative effects on the success of the therapy. Furthermore, this type of control is both difficult and expensive.

That's why we, as doctors and therapists involved in treatment, are watching the development of drug tests on the basis of saliva samples with great interest. This type of test not only corresponds to my, and many others', belief that we should deal with our patients “face to face.” A survey at our clinic produced a clear vote in favor of saliva tests for a number of other reasons ranging from the simple and economical nature of the process to the fact that no manipulative strategy can be discerned here. Our clients share this opinion.

We are well aware that we cannot rely solely upon the honesty and self-control of patients during treatment. Drug-dependent patients have the all-too-human traits of concealing and suppressing uncomfortable feelings and events. Patients do not acknowledge relapses; they deny them—to others and to themselves. That's why we need a method of implementing controls that is based on mutual trust. Only then can we deal constructively with relapses during treatment. The means of control must be compatible with the attitudes displayed by staff members throughout the course of treatment—in other words, a combination of empathy, understanding, and acceptance of the person involved. *Dr. Clemens Veltrup*

..... or cocaine via the nose **Snowbird**—a cocaine addict **Speedball**—usually a combination of heroin and cocaine or amphetamine **Spike**—a drug. Also
..... —amphetamines **WTC**—heroin (after September 11) **Yerba**—marijuana (Mexican) **Zero**—opium **Zombie**—addict **Zonked**—extremely high on drugs <